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PHASE 2 REPORT AND WORK PLAN

CHARACTERIZATION OF CAULK IN CONCRETE PAVEMENTS AT BOEING PLANT 2

Boeing Plant 2
Seattle/Tukwila, Washington

Prepared for:

The Boeing Company
P.O. Box 3707, M/C 1W-12
Seattle, Washington 98124

October 2008

Prepared by:

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The Boeing Company
P.O. Box 3707
Seattle, WA 98124-2207

October 16, 2008
G-1241-WDE-190

CERTIFIED MAIL – RETURN RECEIPT REQUESTED

Christy Brown
U.S. Environmental Protection Agency
1200 Sixth Avenue, Suite 900, AWT-121
Seattle, Washington 98101

BOEING

Subject: *Phase 2 Report and Work Plan - Characterization of Caulk in Concrete Pavements* Submittal
Boeing Plant 2, Seattle/Tukwila, Washington
EPA ID No. WAD 00925 6819
RCRA Docket No. 1092-01-22-3008(h)

Dear Ms. Brown:

Please find enclosed four (4) copies (each with a CD attached) of the subject report and work plan. Note a CD copy will be provided to Mr. Fujita directly.

This document presents the complete characterization and mapping of caulk in outdoor concrete pavements at Plant 2. There are seventeen types of caulk characterized by appearance and levels of PCBs present as a manufactured bulk product. This document also proposes actions that would be documented further in a separate work plan to remove or stabilize caulk materials based on PCB levels specified in Mr. Blocker's April 11, 2007 letter on this subject. Following your approval of this report and conceptual work plan, Boeing will prepare a Phase 3 work plan specific to those next actions.

Please contact me with any further questions or comments you may have.

Sincerely,

Will Ernst

Will Ernst
Project Coordinator; Environmental Remediation
M/C 1W-12; 425.891.7724; 206.544.7297 (fax); william.d.ernst@boeing.com

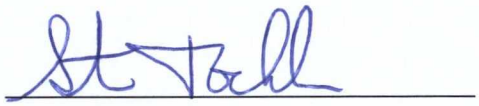
Enclosures

cc: Hideo Fujita, Department of Ecology (w/ enclosure)
Brad Helland, Department of Ecology (by email, w/o enclosure)

As required by Section 15.2 of the Boeing Plant 2, Seattle/Tukwila, Washington, RCRA Administrative Order on Consent, (USEPA ID No. WAD 00925 6819, RCRA Docket No. 1092-01-22-3008(h)), this Certification Statement and Signature accompanies submittal of the following report:

Report: *Phase 2 Report and Work Plan - Characterization of Caulk in Concrete Pavements at Boeing Plant 2, October 2008*

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: 

Name: Steven Tochko

Title: Manager, Environmental Remediation

WAD 6819
Rec 10/7/08 10-6-0
8a/10a
Mike Wemyss

The Boeing Company
P.O. Box 3707
Seattle, WA 98124-2207

October 6, 2008
G-1241-WDE-180

~~**CERTIFIED MAIL - RETURN RECEIPT REQUESTED**~~ HAND DELIVERED

FILE COPY

Christy Brown
U.S. Environmental Protection Agency
1200 Sixth Avenue, Suite 900, AWT-121
Seattle, Washington 98101

Subject: Impacts to Work Progress due to Labor Strike
Boeing Plant 2, Seattle/Tukwila, Washington
EPA ID No. WAD 00925 6819
RCRA Docket No. 1092-01-22-3008(h)

BOEING

Dear Ms. Brown:

It is necessary at this time to advise you of unavoidable delays in certain work due to the ongoing work stoppage by some employees at Boeing who normally provide critical support as we implement various work plans at Plant 2.

1. Sampling has been timely at all locations specified in the 2-40s Area Data Gaps Investigation Work Plan but for 2-40-DP-44, which is in the building overhang area. To safely complete that sampling, cribbing fabricated from steel is required to prevent structural collapse of the overhanging floor and building. Boeing welders who were fabricating the cribbing are now on strike and may not be replaced by alternative welders.

2. Although implementation of the OA-9 remedy system is proceeding well, work to connect electrical components and begin operation of the system will be delayed given the absence of qualified electricians.

Other activities for those two work plans will proceed, but it is now clear uncertain delays will affect plan schedules. I will inform you when resumption of normal activity allows rescheduling of work and associated report deliverables. Work to implement other plans is not affected at this time.

Please contact me if you have any questions or comments.

Sincerely,

Will Ernst

Will Ernst
Plant 2 Project Coordinator
Environmental Remediation
M/C 1W-12; 425.891.7724; 206.544.7297 (fax); william.d.ernst@boeing.com

cc: Hideo Fujita, Dept. of Ecology (by email)
Brad Helland, Dept. of Ecology (by email)

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ELECTRONIC COPIES ONLY, ON CD ATTACHED TO REPORT

List of Abbreviations/Acronyms

Abbreviation/Acronym	Definition
Boeing	The Boeing Company
EPA	United States Environmental Protection Agency
Golder	Golder Associates, Inc.
IM	Interim Measure
IM Work Plan	Interim Measure Work Plan: Characterization of Caulk in Concrete Pavements at Boeing Plant 2
NPDES	National Pollutant Discharge Elimination System
PCB	polychlorinated biphenyl
ppm	parts per million
OA	Other Area
Order	Order on Consent
RCRA	Resource Conservation and Recovery Act
RL	reporting limit
SWMU	Solid Waste Management Unit

1.0 INTRODUCTION

The Boeing Company (Boeing) has completed detailed mapping of caulk types and the collection of additional caulk samples from concrete pavements in the 2-10, 2-40s, and 2-60s/2-66 Areas of the Plant 2 facility in Seattle/Tukwila, Washington. The caulk samples were analyzed for polychlorinated biphenyls (PCBs) in accordance with the Interim Measure (IM) Work Plan, Characterization of Caulk in Concrete Pavements at Boeing Plant 2, dated August 2007 (Golder 2007a). The IM Work Plan was prepared, and the subject portion of the IM was performed, in accordance with Administrative Order on Consent (Order) No. 1092-01-22-3008(h) between Boeing and the Environmental Protection Agency (EPA) Region X. The Order is issued pursuant to Section 3008(h) of the Solid Waste Disposal Act, also referred to as the Resource Conservation and Recovery Act (RCRA). The Work Plan was submitted pursuant to EPA's February 15, 2007 and April 11, 2007 letters, the latter being sent following Boeing's February 26, 2007 letter, and discussions on this subject. In short, the EPA letters required Boeing to submit an interim measure work plan to identify all polychlorinated biphenyl (PCB) contaminated caulk at the facility with concentrations of PCBs above 1 part per million (ppm). The April 2007 letter specified inclusion of a discussion on the removal of all caulk with PCB concentrations in excess of 50 ppm and the stabilization (or removal) of all caulk with PCB concentrations greater than 25 ppm and less than or equal to 50 ppm. Methods of removal and stabilization considered in the IM Work Plan are further discussed in this Phase 2 Report and Work Plan (Phase 2 Report) in anticipation of a Phase 3 work plan for specific removal and/or stabilization objectives.

In accordance with the IM Work Plan, this Phase 2 Report describes the caulk mapping, sampling, analysis, and review of data done to characterize the joint caulk in the outdoor concrete pavements of Plant 2. It also provides recommendations for removing or stabilizing caulk materials according to their respective PCB concentrations.

1.1 Background

Plant 2 is located on 107 acres between the Duwamish Waterway and East Marginal Way South in Seattle and Tukwila, Washington (Figure 1). With the exception of small landscaped areas, the ground surface at Plant 2 is topographically flat and either paved or covered by buildings. Stormwater falling upon pavement or buildings is discharged to the Duwamish Waterway under a National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Stormwater Discharges Associated with Industrial Activities, in compliance with the State of Washington Water Pollution Control Law (Chapter 90.48 RCW) and the Federal Water Pollution Control Act (The Clean Water Act) (Title 33 United States Code, Section 1251 et seq.).

1.2 Description of Plant 2 Outdoor Pavements and Slabs

The outdoor pavements at Plant 2 were divided into five geographical areas for the purpose of this IM Work Plan (Figure 2). The five geographical areas include the North Area, the 2-10/31 Area (2-10 Area), the 2-40s Area, the 2-60s/2-66 Area (2-60s Area), and the South Yard. Figure 2 includes estimates of the pavement areas and joint lengths for each of these areas. The outdoor surfacing in the North Area comprises an area of approximately 13 acres, and consists primarily of recent asphalt with little or no caulk material. The outdoor surfacing in the 2-10, 2-40s, and 2-60s Areas comprises an area of approximately 29 acres, and consists

primarily of older, jointed and/or cracked concrete with caulk material in the joints and/or cracks. The outdoor surfacing in the South Yard comprises an area of approximately ten acres, and consists primarily of recent asphalt with little or no caulk material. Within these Areas a few locations warrant special mention. A small space near the SCL Transformer pad (OA-11) is concrete containing little caulk that will be excavated and replaced with asphalt when that space is remediated; and the area was therefore not included in this work plan. Some small paved spaces east of the 20-series buildings are comprised of concrete and joint materials constructed in the 1990s; given their recent construction these small spaces were not included in this work plan. Similarly, on the east margin of the 2-10 Area recent refurbishment of the jet fuel tank space included removal and replacement of its original caulk; as such, that small space was also not included in this characterization work (See Figure 3).

As is described further below, the outdoor concrete pavements in the 2-10 and 2-40s Areas and the concrete pavements and slabs in the 2-60s Area were the focus of this IM Work Plan due to the presence, age and nature of the caulk materials in concrete in those areas.

1.3 Recent Actions

1.3.1 Caulk Investigations

2005/2006 2-60s Area Investigation

Between October 2005 and April 2006, following identification of PCBs in catch basin solids samples collected in stormlines X and Y, Boeing investigated caulking materials that had been applied to joints in paved roadways and concrete slabs in the drainage area served by Lines X and Y (2-60s Area). The investigation was conducted to provide an indication of whether joint caulk materials may have been a possible source of PCBs. Inspection of these areas revealed multiple applications of a variety of caulk materials used to seal cracks and seams in the roadways and building slabs. Sample locations were selected based on their variability of joint materials and the relative amount of joint material present. Forty-six caulk samples, representative of the numerous types of caulk material (based on appearance) in the area, were collected during that investigation. The visually identifiable physical characteristics of the joint materials were recorded for each sample location, and the samples were sent to an analytical laboratory for testing. Results for PCBs ranged from non-detect (at a reporting limit [RL] of 0.79 ppm) to 40,500 ppm. A summary of the results of the 2005/2006 investigation was presented as Table 1 in Attachment A of the IM Work Plan (Golder 2007a). The PCB concentrations in caulk used in the 2-60s Area concrete pavement areas were consistently and significantly lower than concentrations in the caulk used in the 2-60 Area building concrete slabs that were left in place temporarily following demolition of their overlying building structures. Additional review, sampling, analysis and evaluation of the 2005/2006 data were performed for characterization purposes in support of the Phase 1 investigation in 2007 (see Phase 1 Report and Work Plan, Characterization of Caulk in Concrete Pavements at Plant 2 [Phase 1 Report], dated May 2008 (Golder 2008a)).

Phase 1 Investigation

During 2007, a systematic approach was implemented to develop a baseline characterization of the caulk types in the concrete slabs and pavements in the 2-10, 2-40s, and 2-60s Areas:

- The 2005/2006 caulk data from the 2-60s Area were first reviewed and evaluated to describe and determine caulk physical appearances that could be used to identify those same caulks that may be present elsewhere in the study area. Samples were collected during 2007 at the same locations as most of the 2005/2006 samples to enable closer visual examination of the caulks and standardization of caulk descriptions. Additionally, several duplicate samples were submitted for laboratory analyses in cases where the 2005/2006 analytical data indicated PCB reporting limits (RLs) above 1 ppm that would compromise the use of those earlier results.
- Caulk sampling and analytical testing were conducted on caulks in the 2-10 and 2-40s Areas. Data for the 2-10, 2-40s and 2-60s Areas were then reviewed and evaluated with the objective of establishing the visual properties for each distinct caulk type that could in turn be used to systematically identify all caulks and their respective concentrations of PCBs.
- Caulk types were initially evaluated and characterized on the basis of visual properties first separately by area, and then collectively for all three areas.

Careful review of existing data and close examination of caulk material samples resulted in the identification of fifteen types of caulk materials in the outdoor pavements of the 2-10, 2-40s, and 2-60s Areas, based upon visually identifiable physical properties (appearance and texture). Several of the caulk types were observed in all three areas, but most caulk types were not observed in all three areas.

As indicated in the EPA-approved Phase 1 Report (Golder 2008a), most caulk types had consistent ranges of PCB concentrations. Detailed mapping of the caulk types was planned for the Phase 2 investigation in accordance with the following categories of PCB concentrations as outlined in the Phase 1 Report:

- Two caulk types with PCB concentrations ≤ 1 ppm.
- Ten caulk types with PCB concentrations > 1 ppm and ≤ 25 ppm.
- One caulk type with a PCB concentration > 25 ppm and ≤ 50 ppm.
- One caulk type with PCB concentrations ranging from > 1 ppm to ≤ 50 ppm. This caulk type was divided into two subsets based upon PCB concentrations - one with > 1 ppm and ≤ 25 ppm PCBs and the other with > 25 ppm and ≤ 50 ppm PCBs. Additional sampling of this caulk type was planned for Phase 2 to better understand the distribution of the subset caulks based on PCB concentrations.
- One caulk type with PCB concentrations ranging widely from > 1 ppm to > 50 ppm. This caulk type was divided into two subsets based upon PCB concentrations - one with > 1 ppm and ≤ 25 ppm PCBs and the other with > 50 ppm PCBs. Additional sampling was planned for Phase 2 to better understand the distribution of the subset caulks based upon PCB concentrations.

1.3.2 Past Construction and Removal Activities

In March 2006, installation of a temporary stormwater collection and treatment system was completed to replace the drainage capacity of stormlines X and Y. This construction activity included the temporary sealing at the surface of all the catch basins and manholes on the X and

Y lines to remove those lines from service, and the installation of new drains, lines, asphalt swales and a modern treatment vault which collects solids and stormwater and conveys stormwater into stormline Z. Line Z is immediately south of the X and Y lines. In October 2006 following a video survey, the catch basins and manholes on the X and Y lines in the area of the 2-66 slab were backfilled with controlled density fill (CDF) and the accessible outfalls for those lines were sealed at the waterway. In May 2007, Boeing completed the removal of the X and Y lines from the 2-60s Area (east of the 2-66 slab), as documented in the EPA-approved Interim Measure Completion Report, Removal of Stormwater Lines X & Y (OA 23.1 and OA 23.2) in 2-60s Area at Boeing Plant 2, dated May 2008 (Golder 2008b). Additionally, Building 2-64 was demolished in May 2007 and its foundations and immediately-adjacent pavements were removed and replaced with asphalt surfacing.

As a result of the removal of those X and Y stormlines and the demolition of Building 2-64, caulks at the locations of five of the caulk samples collected in the 2-60s Area during 2005/2006 were removed. These five caulk samples had PCB concentrations ranging from non-detect (at an RL of 0.8 ppm) to 740 ppm. Additionally, all caulk represented by three samples containing PCB concentrations ranging from 29,300 ppm to 40,500 ppm were removed by Boeing from a single equipment foundation on the Building 2-65 slab (see Figure 6).

1.3.3 Stormwater Sampling

Given the possible association between the caulk at Plant 2 as a potential source of PCBs and the PCB concentrations detected in the stormwater system solids, it is appropriate to consider information regarding stormwater source control sampling. Accordingly, and to further investigate concentrations of PCBs and metals detected in catch basin solids during the 2005 survey of the Plant 2 stormwater system, Boeing initiated an annual stormwater source control sampling program to evaluate the potential for active stormwater lines at Plant 2 to convey hazardous substances to the Duwamish Waterway via stormwater discharges. To address EPA's requirements for this work identified in a May 26, 2006 letter, the Stormwater Source Control Work Plan for Boeing Plant 2 (Golder, 2006) was drafted and then approved in October, 2006. That work plan established a source control sampling program consisting of one-time or annual sampling and analysis of suspended solids and/or water along 12 of the 24 active stormwater lines at Plant 2 during the rainy season (approximately October to March). Source control sampling results are compared to action levels established in the work plan, and action level exceedences trigger further actions such as additional monitoring, source identification and/or source control or elimination work.

The first round ("round 1") of source control sampling was conducted between October 2006 and April 2007, and the round 1 sampling report (Golder, 2007b) was approved by EPA in October 2007. Round 2 sampling was conducted between October 2007 and May 2008 in accordance with the Revised Stormwater Source Control Work Plan for Boeing Plant 2 (Golder, 2007c). The round 2 sampling report was submitted to EPA in May 2008, conditionally approved with comments by EPA in August, 2008, and resubmitted for final approval in September, 2008 (Golder 2008c). Annual source control sampling will continue until baseline conditions have been established, and appropriate source control actions have been identified, completed, and verified.

2.0 OBJECTIVE OF INTERIM MEASURE

The objective of this IM was to determine and map the locations of caulk materials containing PCB concentrations above 1 ppm, and to determine and map the locations subject to required actions for caulk materials containing PCB concentrations above 25 ppm in the outdoor concrete pavements at Plant 2. Specifically, the objective was to establish the visual properties that could be used to visually distinguish between and by association identify the locations of caulk materials containing the following PCB concentration categories:

- Caulks with PCB concentrations ≤ 1 ppm;
- Caulks with PCB concentrations > 1 ppm and ≤ 25 ppm;
- Caulks with PCB concentrations > 25 ppm and ≤ 50 ppm; and
- Caulks with PCB concentrations > 50 ppm.

This objective was to be accomplished in phases. Phase 1 provided a baseline characterization of caulk materials and included correlation of caulk physical properties (i.e., appearance and texture) to PCB concentrations in the caulk. The characterization was presented in the Phase 1 Report (Golder 2008a), which established the visual properties and sampling approach to be used during the Phase 2 investigation to categorize and map all caulks relative to the above ranges of PCB concentrations. Phase 2 included: 1) sampling and testing of newly-observed caulk types that were not previously identified, 2) additional sampling and testing of two previously identified caulk types that exhibited wide ranges of PCB concentrations, 3) detailed mapping of all of the caulks characterized during Phase 1 and Phase 2 of this IM Work Plan, and 4) proposing actions for caulk materials containing PCB concentrations > 25 ppm.

The results of the Phase 2 investigation and concepts to be developed in the next, Phase 3, work plan are presented in this report. Upon approval of this Phase 2 Report, a Phase 3 Work Plan will be prepared specific to the implementation of caulk removal or stabilization activities for caulk that contains PCB concentrations > 50 ppm, or > 25 ppm and ≤ 50 ppm, respectively.

3.0 CAULK CHARACTERIZATION, SAMPLING, AND MAPPING

3.1 Review of Phase 1 Characterization

The Phase 2 approach and results built upon Phase 1 and prior caulk characterization work. As was first introduced in Section 1.3.1 above, the Phase 1 Report and Work Plan (August 2007) used earlier results to develop a systematic approach to develop a baseline characterization of the caulk types to be mapped in the three subject areas. This earlier work is summarized here area by area, leading to the structured approach that was applied in Phase 2 work.

3.1.1 2-60s Area Caulk Investigations

Boeing first conducted an investigation of the caulk in concrete pavements and slabs in the 2-60s Area between October 2005 and April 2006. Forty-six caulk samples were collected during that investigation to provide an indication of whether the caulk could potentially have been a source of the PCBs detected in the stormwater system in that part of Plant 2. Samples were collected based upon physical appearance, with the greatest number of samples representing the most predominant caulk types observed in the area. The original sample descriptions included such physical properties as color and texture. Analytical results for the samples indicated PCB concentrations ranging from non-detect (at an RL of 0.79 ppm) to 40,500 ppm, with the higher values being consistently associated with building slab caulk applications, as opposed to road or parking lot caulk applications. The original caulk descriptions and PCB concentrations were presented in Table 1 of Attachment A in the IM Work Plan (Golder 2007a).

The Phase 1 (2007) investigation of caulk materials in the 2-60s Area then included the primary tasks described below.

- **Data review:** The 2005/2006 descriptions of the caulk materials and the PCB concentrations of all the samples were reviewed and evaluated for characterization standardization purposes.
- **New archive samples:** To enable a closer and systematic examination of the caulk materials and standardized descriptions of the 46 caulk samples from the 2-60s Area, archive samples were collected during 2007 at the same locations as the original 2005/2006 samples, with the exception of the eight sample locations where the caulk materials had been removed. The exact locations of the new archive samples were determined by the 2005/2006 sample location map descriptions and markings on the pavement.
- **Sample descriptions and categories:** Archived samples were visually examined and descriptions were recorded on field sampling sheets. The archived samples were then re-examined and caulk types were assigned to the samples based upon the observed physical characteristics of the caulk materials. The 2005/2006 caulk descriptions were used to categorize the eight caulk samples that had been previously removed.
- **Duplicate samples for laboratory analyses:** Four samples were collected in 2007 and submitted for laboratory analyses. The collected samples were intended as duplicates of specific 2005/2006 samples that had non-detected PCB concentrations at RLs greater than 1 ppm. The 2005/2006 elevated RLs were due to chromatographic interferences

during the analyses. An additional cleaning step was applied during the preparation of the 2007 samples to reduce chromatographic interference, and the samples were then analyzed achieving a lower RL than reported for those samples in the data suite from 2005/2006.

As a result of the Phase 1 investigation, eleven caulk types were identified in the 2-60s Area.

3.1.2 2-10 Area Caulk Investigation

Using the work done in the 2-60s Area, a grid system of north-south and east-west trending lines was established on maps of the 2-10 Area for the purpose of randomly selecting locations for sampling and characterizing the caulk in the concrete pavements. The grid lines generally had a spacing of 75-feet forming a series of 75-foot square blocks, however, due to pavement configurations some of the blocks had irregular shapes. A total of 83 sampling blocks were prescribed, and each block was assigned a unique identification number. Using a random number generating program, AbleBits™, Version 1.2.0.14, ten of the blocks were randomly selected for caulk sampling and characterization (Figure 3).

In each of the ten selected blocks, all of the caulk types found were visually examined and physically characterized based on color and texture of both weathered and fresh surfaces. Samples were collected of each caulk type observed in each of the blocks, the physical characteristics of the samples were recorded on field sampling sheets, and the samples were submitted for PCB analysis. Archive samples were also collected to enable follow-up examination of the caulk materials and further standardization of the descriptions. This process provided representative samples for the physical and chemical (PCB) characterization of the caulk types observed in the 2-10 Area.

As a result of the Phase 1 investigation, a total of 33 samples were collected and eight caulk types were identified in the 2-10 Area.

3.1.3 2-40s Area Caulk Investigation

Similar to the process outlined in Section 3.1.2, a grid system of north-south and east-west trending lines was established on maps of the 2-40s Area for the purpose of randomly selecting locations for sampling and characterizing the caulk in the concrete pavements. The grid lines generally had a spacing of 75-feet forming a series of 75-foot square blocks, however, due to pavement configurations some of the blocks had irregular shapes. A total of 30 sampling blocks were prescribed, and each block was assigned a unique identification number. Using the random number generating program, AbleBits™, Version 1.2.0.14, ten of the blocks were randomly selected for caulk sampling and characterization (Figure 3).

In each of the ten selected blocks, all of the caulk types found were visually examined and physically characterized based on color and texture of both weathered and fresh surfaces. Samples were collected of each caulk type observed in each of the blocks, the physical characteristics of the samples were recorded on field sampling sheets, and the samples were submitted for PCB analysis. Archive samples were also collected to enable follow-up examination of the caulk materials and further standardization of the descriptions. This process

provided representative samples for the physical and chemical (PCB) characterization of the caulk types observed in the 2-40s Area.

As a result of this investigation, a total of 34 samples were collected and seven caulk types were identified in the 2-40s Area.

3.1.4 Phase 1 Caulk Characterization Summary

The baseline characterization of caulk materials in the 2-10, 2-40s, and 2-60s Areas of Plant 2 comprised Phase 1 of the IM Work Plan and resulted in the identification of fifteen types of caulk materials based upon physical characteristics. The visual indicators established by the characterization proved to be a reliable and fairly consistent means of distinguishing between different caulk products and the PCB concentration ranges presented in Section 2 of this report, with the exception of caulk types 1A and 1C. Subsets of Types 1A and 1C caulk, based upon PCB concentration ranges, were developed to address the chemical variability in those materials.

Most caulk types contained PCB concentration ranges that were fairly consistent in all three areas of the project, and most PCB concentrations were < 25 ppm, however, several caulk samples contained elevated PCB concentrations that appeared anomalous relative to the rest of the data set. As indicated in the Phase 1 Report, the anomalous PCB concentrations in such samples lead to the proposed conclusion that the highly elevated PCB concentrations may be related to area, building and/or historical material uses at the locations of the subject samples. These elevated PCB concentrations warranted the development of subsets to the caulk types that otherwise contained lower and/or consistent PCB concentrations across the remainder of the site so as to not improperly skew the type data set. A tabular summary of the Phase 1 characterization, including both physical descriptions and PCB concentration ranges, is presented below.

Caulk Type	Subset Caulk Types*	PCB Concentration Range	Color	Description
1A	1A1	>1 ppm & ≤25 ppm	Dull black	Stiff to hard. Fresh surface black, glassy, rough, crumbly.
	1A2	> 50 ppm		
1B		>1 ppm & ≤25 ppm	Dull black	Stiff to hard, brittle. Fresh surface black, glassy, concoidal fracture.
1C	1C1	>1 ppm & ≤25 ppm	Dull black	Same as Type 1A, but includes metal shavings, small screws, etc. in caulk matrix.
	1C2	>25 ppm & ≤50 ppm		
1D		>1 ppm & ≤25 ppm	Dull black	Same as Type 1A, but pliable to semi-pliable.
1E		>1 ppm & ≤25 ppm	Dull black	Soft to stiff, pliable to semi-pliable. Fresh cut surface dull to semi-glossy black,
2A		>1 ppm & ≤25 ppm	Light gray	Soft to stiff, pliable, spongy to rubbery.
2B		< 1 ppm	Light gray	Strong, very stiff to very hard, brittle.
2C		< 1 ppm	Dull gray	Stiff to hard, pliable.
3		>1 ppm & ≤25 ppm	Brown to black	Soft to firm, pliable & spongy.
4		>25 ppm & ≤50 ppm	Dull brown or black	Soft, fibrous, friable.
5		>1 ppm & ≤25 ppm	Brown	Soft, pliable, spongy, stretchy, sticky.
6		>1 ppm & ≤25 ppm	Red-brown to black	Stiff, semi-pliable. Fresh surface smooth, yellow/brown/orange.
7		>1 ppm & ≤25 ppm	Amber	Smooth, translucent, very hard, glassy.
8A		>1 ppm & ≤25 ppm	White	Soft to stiff, pliable, spongy.
8B		>1 ppm & ≤25 ppm	White	Firm to stiff, finely wrinkled, cracked. Fresh surface smooth, dull grayish-white.

* Subset caulk types based on range of PCB concentrations
Note: Extent of caulk material exposure to sun or vehicular traffic was not a determinative factor in this characterization process.

3.2 Phase 2 Caulk Characterization, Sampling, and Mapping

3.2.1 Mapping

Detailed mapping of caulk materials was performed during 2008 in the 2-10, 2-40s, and 2-60s Areas based upon the visual properties established by the Phase 1 baseline characterization. The mapping was required to identify the specific locations of caulk materials containing > 1ppm PCBs; to enable an evaluation of recent catch basin and stormwater sampling results versus the areas containing caulk with elevated concentrations of PCBs such that stormwater source control issues can be better understood; and to enable recommendations regarding actions where deemed necessary, including prioritization of the most severely weathered caulk materials that require removal (> 50 ppm PCBs) or stabilization (>25 ppm and ≤ 50 ppm PCBs). Two additional variations of a previously identified caulk material were discovered during the

mapping process; those additional types were mapped, sampled, tested for PCBs, and characterized per the baseline characterization process.

3.2.2 Additional Sampling and Testing

A total of 107 additional caulk samples were collected in the 2-10, 2-40s, and 2-60s Areas during the Phase 2 investigation, including 58 samples of Type 1A caulk, 23 samples of Type 1C caulk, and 26 samples of new varieties of Type 4 caulk that were discovered during the detailed mapping process. The Type 1A and 1C samples were collected to better define the locations of caulk materials requiring further action. The Type 4 samples were collected for characterization purposes and resulted in the designation of three types of that caulk, including Type 4A (formerly designated as Type 4), and new caulk Types 4B and 4C.

3.2.2.1 Type 1A and Type 1C Caulks

Additional sampling and testing of Type 1A and Type 1C caulks were conducted to determine the areal extents of the subsets (Types 1A1 & 1A2 and Types 1C1 & 1C2) of each of these caulk types, based on PCB concentrations.

2-10 & 2-40s Areas

One sample of Type 1A caulk and/or one sample of Type 1C caulk were collected in each odd-numbered sampling block where these materials were found, except for the blocks where these caulk types were previously sampled. The sampling block grid is shown on Figure 3.

A total of 37 additional samples of Type 1A caulk were collected in the 2-10 Area, and 5 samples were collected in the 2-40s Area during the Phase 2 investigation. In the 2-40s Area, the 5 samples of Type 1A caulk were designated as subset Type 1A1 caulk based on the PCB concentration range of > 1 ppm and ≤ 25 ppm. In the 2-10 Area, 31 of the samples were designated as subset Type 1A1 caulk based on the PCB concentration range of > 1 ppm and ≤ 25 ppm; 2 of the samples were designated as subset Type 1A2 caulk based on PCB concentrations > 50 ppm; and 4 of the samples had PCB concentrations that ranged from > 25 ppm to ≤ 50 ppm, a PCB concentration range not previously found in Type 1A caulks. The new range of PCB concentrations warranted the addition of a third subset of Type 1A caulk, designated as Type 1A3.

A total of 12 additional samples of Type 1C caulk were collected in the 2-10 Area, and 2 samples were collected in the 2-40s Area during the Phase 2 investigation. In the 2-10 Area, 11 of the samples were designated as subset Type 1C1 caulk based on the PCB concentration range of > 1 ppm and ≤ 25 ppm, and 1 of the samples was designated as subset Type 1C2 caulk based on the PCB concentration range of > 25 ppm and ≤ 50 ppm. In the 2-40s Area, 2 samples of Type 1C caulk were collected, and both samples were designated as subset Type 1C1 caulk based on the PCB concentration range of > 1 ppm and ≤ 25 ppm.

The analytical data is presented in attached Tables 1 and 2, and the sample locations, caulk types, and PCB concentrations are shown on Figures 4 and 5.

2-60s Area

Similar to the grid system of north-south and east-west trending lines and the resultant sampling blocks that were established on maps of the 2-10 and 2-40s Areas, a grid system and sampling blocks were established on a map of the 2-60s Area. The grid system was laid-out to segregate sampling blocks on building slabs from those on road or parking lot areas to reflect previous observations that the higher PCB concentrations in this area were consistently associated with building slab caulk applications, as opposed to road or parking lot caulk applications. The template for the grid lines generally formed a series of 75-foot square blocks, however, due to pavement and slab configurations many of the blocks had irregular shapes. A total of 103 sampling blocks were prescribed, and each block was assigned a unique identification number. One sample of Type 1A caulk and/or one sample of Type 1C caulk was collected in each odd-numbered sampling block where these materials were found, except for blocks where these caulk types were previously sampled. The sampling block grid is shown on Figure 3.

A total of 16 additional samples of Type 1A caulk were collected in the 2-60s Area, during the Phase 2 investigation. Fourteen of the samples were designated as subset Type 1A1 caulk based on the PCB concentration range of > 1 ppm and ≤ 25 ppm; 1 of the samples was designated as subset Type 1A2 caulk based on the PCB concentration > 50 ppm; and 1 of the samples was designated as new subset Type 1A3 based on the PCB concentration in the range > 25 ppm and ≤ 50 ppm. Additionally, the designation of a Phase 1 sample was revised from subset Type 1A1 to new subset Type 1A3 based on the PCB concentration > 25 ppm and ≤ 50 ppm.

A total of 9 additional samples of Type 1C caulk were collected in the 2-60s Area, during the Phase 2 investigation. Seven of the samples were designated as subset Type 1A1 caulk based on the PCB concentration range of > 1 ppm and ≤ 25 ppm, and 2 of the samples were designated as subset Type 1A2 caulk based on the PCB concentration > 25 ppm and ≤ 50 ppm.

The analytical data is presented in attached Tables 1 and 2, and the sample locations, caulk types, and PCB concentrations are shown on Figure 6.

3.2.2.2 New Type 4 Caulks

Detailed mapping of caulk in the 2-10, 2-40s, and 2-60s Areas resulted in the discovery of three different kinds of Type 4 caulk based on visually identifiable physical characteristics, and two subsets of one of the caulk types based on PCB concentrations. Type 4 caulk is generally a fiberboard material that was used in several construction or expansion joints. The Type 4 material was initially discovered in the 2-60s Area during the 2005/2006 investigation and during the Phase 1 investigation (2007), but was not found in the 2-10 or 2-40s Areas during those investigations. During the Phase 2 (2008) detailed mapping of caulk joints, more of these materials were found under dirt and moss infilled joints in the 2-10, 2-40s, and 2-60s Areas. Variations in the physical properties of the caulk warranted the designation of three types of the fiberboard material: Type 4A (formerly designated as Type 4), Type 4B, and Type 4C. The physical properties that warranted the designation of three different caulk types included the size and color of the fibers in the fiberboard, and the consistency of the material. Additional sampling and analyses of these materials during the Phase 2 investigation enabled the

additional designation of two subsets of the Type 4A caulk based on PCB concentrations, and caulk subsets 4A1 and 4A2 were therefore assigned.

Twenty six samples of the Types 4A, 4B, and 4C caulks were collected during the Phase 2 investigation in general accordance with the characterization sampling protocol established for the Phase 1 investigation. In the 2-10 and 2-40s Areas, samples of the Type 4 materials were collected when present from the randomly selected sampling blocks that were used for characterization purposes during the Phase 1 investigation. Similarly in the 2-60s Area, the protocol of sampling from those blocks that were originally sampled in 2005/2006 was adapted for the characterization purposes of this investigation. Samples of each of the Type 4 materials were collected when present from those sampling blocks in the 2-60s Area where any caulks had been initially sampled during the 2005/2006 investigation, provided that the Type 4A caulk had not previously been sampled in a subject block. The sampling blocks are shown on Figure 3. The characterization and analytical testing of the Type 4 caulk samples resulted in the designation of the PCB concentration ranges for the caulk types shown below:

- Type 4A1: > 1 ppm and ≤ 25 ppm
- Type 4A2: > 25 ppm and ≤ 50 ppm
- Type 4B: > 1 ppm and ≤ 25 ppm
- Type 4C: > 1 ppm and ≤ 25 ppm

2-10 and 2-40s Areas

Eight samples were collected from the prescribed sampling blocks in the 2-10 and 2-40s Areas. Six samples in the 2-10 Area were physically characterized as Type 4B caulk, and analytical results indicated that PCBs were not detected in concentrations > 1 ppm in any of the samples. However, the analytical reporting limit for one of the samples was >1 ppm, so the group of samples was conservatively designated as containing > 1 ppm and ≤ 25 ppm PCBs.

One sample of Type 4C caulk was collected in the 2-10 Area and one sample of that caulk type was collected in the 2-40s Area. Analytical results for the two Type 4C samples indicated PCB concentrations ranging from non-detect to 11 ppm. The samples were designated as containing > 1 ppm and ≤ 25 ppm PCBs. No Type 4B caulk was found in the designated sampling blocks in the 2-40s Area, and no Type 4A caulk was found in any of the designated sampling blocks in the 2-10 or 2-40s Areas.

The analytical data is presented in attached Tables 1 and 2, and the sample locations, caulk types, and PCB concentrations are shown on Figures 4 and 5.

2-60s Area

In the 2-60s Area, 18 samples were collected during the Phase 2 investigation from designated sampling blocks where the caulks had not previously been sampled. Five of the samples were

characterized as Type 4A caulk, and analytical results indicated PCB concentrations ranging from 2.3 ppm to 29 ppm, including . Three of the five Type 4A samples had PCB concentrations > 25 ppm and ≤ 50 ppm, while the other two Type 4A samples had PCB concentrations > 25 ppm and ≤ 50 ppm. Based on the PCB concentrations, two subsets, Type 4A1 (> 1 ppm and ≤ 25 ppm) and Type 4A2 (> 25 ppm and ≤ 50 ppm) were designated.

Six samples of Type 4B caulk were collected from designated sampling blocks, and analytical results indicated PCB concentrations ranging from non-detect to 22.8 ppm. The Type 4B caulk was subsequently designated as containing > 1 ppm and ≤ 25 ppm PCBs.

Seven samples of Type 4C caulk were collected from designated sampling blocks, and analytical results indicated PCB concentrations ranging from non-detect to 15.6 ppm. The Type 4C caulk was subsequently designated as containing > 1 ppm and ≤ 25 ppm PCBs.

The analytical data is presented in attached Tables 1 and 2, and the sample locations, caulk types, and PCB concentrations are shown on Figure 6.

3.3 Total Caulk Characterization, Sampling, and Mapping Summary

The Phase 1 and Phase 2 caulk investigations of the outdoor concrete pavements and slabs in the 2-10, 2-40s, and 2-60s Areas at Plant 2 resulted in the visual identification of 17 types of caulk materials based on physical characteristics such as color, texture and consistency. Detailed mapping of the 17 caulk types was performed, and the mapping is presented on Figures 4, 5, and 6.

A total of 224 samples of caulk materials were collected and analyzed for PCBs during the 2005/2006, Phase 1, and Phase 2 investigations, and PCB concentration ranges were designated for each of the 17 caulk types identified. Three of the caulks, Types 1A, 1C, and 4A, were divided into subsets based on varying ranges of PCBs detected in those materials. Including the subset caulks, 21 caulk categories were identified based upon PCB concentration ranges and physical characteristics. The caulk types and their PCB concentration ranges are discussed below.

Type 1A: Ninety samples collected in the 2-10, 2-40s, and 2-60s Areas contained PCB concentrations ranging from non-detect (at an RL of 0.73 ppm) to 39,000 ppm. Type 1A caulk was divided into three subsets based upon ranges of PCB concentrations:

- **Type 1A1 Subset (>1 ppm and ≤25 ppm PCBs):** Seventy-six samples, including 41 collected in the 2-10 Area, 10 collected in the 2-40s Area, and 25 collected in the 2-60s Area contained PCB concentrations ranging from non-detect (at an RL of 0.73 ppm) to 24.8 ppm.
- **Type 1A2 Subset (>50 ppm PCBs):** Eight samples, including 5 collected on the 2-62 slab, one collected near the southwest corner of Building 2-64, one collected on the 2-65 slab, and 2 collected on the east side of Building 2-15 contained PCB concentrations ranging from 54 to 39,000 ppm.

- **Type 1A3 Subset (>25 ppm and ≤50 ppm PCBs):** Six samples, including 4 collected in the 2-10 Area and 2 collected in the 2-60s Area contained PCB concentrations ranging from 25.8 to 48 ppm.

Type 1B (>1 ppm and ≤25 ppm PCBs): Eighteen samples, including 8 collected in the 2-10 Area, six collected in the 2-40s Area, and 4 collected in the 2-60s Area contained PCB concentrations ranging from non-detect (at an RL of 0.79 ppm) to 8.1 ppm.

Type 1C: Twenty-nine samples collected in the 2-10, 2-40s and 2-60s Areas contained PCB concentrations ranging from 2.2 to 44 ppm. Type 1C caulk was divided into two subsets based upon ranges of PCB concentrations:

- **Type 1C1 Subset (>1 ppm and ≤25 ppm PCBs):** Twenty-three samples, including 11 collected in the 2-10 Area, five collected in the 2-40s Area, and 7 collected in the 2-60s Area had PCB concentrations ranging from 2.2 to 24 ppm.
- **Type 1C2 Subset (>25 ppm and ≤50 ppm PCBs):** Six samples, including 4 collected in the 2-10 Area and 2 collected in the 2-60s Area had PCB concentrations ranging from 29 to 40 ppm.

Type 1D (>1 ppm and ≤25 ppm PCBs): One sample collected in the 2-40s Area contained a PCB concentration of 8.3 ppm.

Type 1E (>1 ppm and ≤25 ppm PCBs): Twenty-two samples, including 4 collected in the 2-10 Area, fifteen collected in the 2-40s Area, and 3 collected in the 2-60s Area contained PCB concentrations ranging from non-detect (at an RL of 0.79 ppm) to 3.0 ppm.

Type 2A (>1 ppm and ≤25 ppm PCBs): Nine samples were collected, including 3 in the 2-10 Area, three in the 2-40s Area, and 3 in the 2-60s Areas, and no PCBs were detected in any of the samples. However, due to chromatographic interference during the analyses of some of the samples, the RLs for the non-detected PCB concentrations ranged from 0.79 to 2.0 ppm. With RLs exceeding 1 ppm, the caulk was conservatively categorized as containing >1 ppm and ≤25 ppm PCBs.

Type 2B (<1 ppm PCBs): One sample was collected in the 2-10 Area, and PCBs were not detected in the sample at an RL of 0.8 ppm.

Type 2C (< 1 ppm PCBs): Three samples were collected, including one in the 2-40s Area and two in the 2-60s Area. PCBs were not detected (at an RL of 0.79 ppm) in the sample from the 2-40s Area. The 2 samples from the 2-60s Area were collected from an equipment foundation on the 2-65 slab in 2005/2006, were characterized as Type 2C caulk based upon their 2005/2006 descriptions, and had PCB concentrations of 29,300 ppm and 40,500 ppm. Boeing removed all of the Type 2C caulk material from the equipment foundation on the 2-65 slab. The high concentrations of PCBs in the two 2005/2006 Type 2C caulk samples from the 2-65 slab may have been related to historical uses of the equipment foundation from which the samples were collected. Other than the 2007 sample located in the 2-40s Area, no other Type 2C caulk samples were collected and very little of the caulk type was observed elsewhere onsite during these investigations. The Type 2C caulk was therefore categorized as containing < 1 ppm PCBs as indicated in the Phase 1 Report (Golder 2008a).

Type 3 (>1 ppm and ≤25 ppm PCBs): Four samples, including 2 in the 2-10 Area and 2 in the 2-60s Area, were collected and contained PCB concentrations ranging from non-detect (at an RL of 0.79 ppm) to 2.2 ppm.

Type 4A: Eleven samples collected in the 2-60s Area contained PCB concentrations ranging from 2.3 to 34,000 ppm. Seven of the samples had PCB concentrations ranging from 2.3 to 22.5 ppm, three of the samples had PCB concentrations ranging from 27 to 29 ppm, and one sample had an anomalous PCB concentration of 34,000 ppm. The Type 4A caulk was divided into two subsets during the Phase 2 investigation based on ranges of PCB concentrations.

- **Type 4A1 Subset (>1 ppm and ≤25 ppm PCBs):** Seven samples collected in the 2-60s Area had PCB concentrations ranging from 2.3 to 22.5 ppm.
- **Type 4A2 Subset (>25 ppm and ≤50 ppm PCBs):** Four samples collected in the 2-60s Area had PCB concentrations ranging from 27 to 34,000 ppm. Three of the samples had PCB concentrations between 27 and 29 ppm, and one sample had a PCB concentration of 34,000 ppm. All of the caulk represented by the sample containing 34,000 ppm PCBs was located on and removed by Boeing from the equipment footing on the 2-65 slab where Type 2C caulk containing anomalous PCB concentrations was also removed. The high concentrations of PCBs in the Type 4A and Type 2C caulk samples collected at the equipment foundation on the 2-65 slab may have been related to historical uses of the equipment foundation from which the samples were collected. As a result of the removal of the caulk containing the 34,000 ppm PCBs, the Type 4A2 caulk was categorized as containing >25 ppm and ≤50 ppm PCBs as indicated previously for the Type 4 caulk in the Phase 1 Report (Golder 2008a).

Type 4B (>1 ppm and ≤25 ppm PCBs): Twelve samples, including 6 in the 2-10 Area and 6 in the 2-60s Area, were collected and contained PCB concentrations ranging from non-detect (at an RL of 0.67 ppm) to 22.8 ppm.

Type 4C (>1 ppm and ≤25 ppm PCBs): Nine samples, including one in the 2-10 Area, one in the 2-40s Area, and 7 in the 2-60s Area, were collected and contained PCB concentrations ranging from non-detect (at an RL of 0.71 ppm) to 15.6 ppm.

Type 5 (>1 ppm and ≤25 ppm PCBs): Five samples, three of which were duplicates of the first two samples, were collected in the 2-60s Area. PCBs were not detected in any of the samples as detailed in Section 3.1.2 of the Phase 1 Report. Chromatographic interference during the analyses of the first two samples and a duplicate sample resulted in elevated RLs ranging from 16 ppm to 80 ppm. Re-analyses of duplicates of the first two samples also resulted in chromatographic interference, but the RLs were lowered to 9.6 ppm and 9.9 ppm, thereby superseding the original results. Although PCBs were not detected in any of the samples, RLs exceeding 1 ppm warranted categorizing the Type 5 caulk as containing >1 ppm and ≤25 ppm PCBs.

Type 6 (>1 ppm and ≤25 ppm PCBs): Three samples collected in the 2-60s Area contained PCB concentrations ranging from 6.2 to 10.0 ppm.

Type 7 (>1 ppm and ≤25 ppm PCBs): Two samples collected in the 2-10 Area contained PCB concentrations of non-detect (at an RL of 0.79 ppm) and 3.2 ppm.

Type 8A (>1 ppm and ≤25 ppm PCBs): Three samples, two of which were duplicates of the first sample, were collected in the 2-60s Area. PCBs were not detected in any of the samples as detailed in Section 3.1.2 of the Phase 1 Report. Chromatographic interference during the analyses of the first sample and its duplicate resulted in elevated RLs ranging from 400 ppm to 560 ppm. Re-analyses of a second duplicate sample also resulted in chromatographic interference, but the RL was lowered to 7.8 ppm, thereby superseding the original results. Although PCBs were not detected in any of the samples, the RL exceeding 1 ppm warranted categorizing the Type 8A caulk as containing >1 ppm and ≤25 ppm PCBs.

Type 8B (>1 ppm and ≤25 ppm PCBs): Two samples were collected in the 2-60s Area and contained PCB concentrations of 1.6 ppm and 2.7 ppm.

The analytical data for all samples are summarized in attached Tables 1 and 2, and a tabular summary of the above caulk types and PCB concentration categories is presented below.

Caulk Type	Subset Caulk Types*	PCB Concentration Range	Color	Description
1A	1A1	>1 ppm & ≤25 ppm	Dull black	Stiff to hard. Fresh surface black, glassy, rough, crumbly.
	1A2	> 50 ppm		
	1A3	>25 ppm & ≤50 ppm		
1B		>1 ppm & ≤25 ppm	Dull black	Stiff to hard, brittle. Fresh surface black, glassy, concoidal fracture.
1C	1C1	>1 ppm & ≤25 ppm	Dull black	Same as Type 1A, but includes metal shavings, small screws, etc. in caulk
	1C2	>25 ppm & ≤50 ppm		
1D		>1 ppm & ≤25 ppm	Dull black	Same as Type 1A, but pliable to semi-pliable.
1E		>1 ppm & ≤25 ppm	Dull black	Soft to stiff, pliable to semi-pliable. Fresh cut surface dull to semi-glossy black,
2A		>1 ppm & ≤25 ppm	Light gray	Soft to stiff, pliable, spongy to rubbery.
2B		< 1 ppm	Light gray	Strong, very stiff to very hard, brittle.
2C		< 1 ppm	Dull gray	Stiff to hard, pliable.
3		>1 ppm & ≤25 ppm	Brown to black	Soft to firm, pliable & spongy.
4A	4A1	>1 ppm & ≤25 ppm	Dull gray to brown-black	Soft, fibrous, friable. Wood-like appearance.
	4A2	>25 ppm & ≤50 ppm		
4B		>1 ppm & ≤25 ppm	Dull brown to brown-black	Soft to stiff, fibrous, friable. Fine-med tan fibers, peat moss-like appearance.
4C		>1 ppm & ≤25 ppm	Dull brown to brown-black	Stiff to semi-hard, friable, platy, brittle. Fine light tan fibers, slate-like appearance
5		>1 ppm & ≤25 ppm	Brown	Soft, pliable, spongy, stretchy, sticky.
6		>1 ppm & ≤25 ppm	Red-brown to black	Stiff, semi-pliable. Fresh surface smooth, yellow/brown/orange.
7		>1 ppm & ≤25 ppm	Amber	Smooth, translucent, very hard, glassy.
8A		>1 ppm & ≤25 ppm	White	Soft to stiff, pliable, spongy.
8B		>1 ppm & ≤25 ppm	White	Firm to stiff, finely wrinkled, cracked. Fresh surface smooth, dull grayish-white.

* Subset caulk types based on range of PCB concentrations

Note: Extent of caulk material exposure to sun or vehicular traffic was not a determinative factor in this characterization process.

3.4 Caulk Actions: Recommendations and Prioritization

The caulk characterization and mapping resulted in the identification of four caulk types, including subsets, in the 2-10 Area and the 2-60s Area that require further action based on a PCB concentration action level of 25 ppm. No caulks containing > 25 ppm PCBs were found in the 2-40s Area and, accordingly, no actions are considered in that area.

In accordance with EPA's letter to Boeing on April 11, 2007, the actions required for caulk containing > 25 ppm PCBs include removal of caulks containing PCB concentrations > 50 ppm, and stabilization of caulks containing PCB concentrations>25 ppm and ≤ 50 ppm. The caulk types and/or subsets designated as containing PCB concentrations above the 25 ppm action level are shown in the table in Section 3.3 and listed below:

- Type 1A2: >50 ppm
- Type 1A3: >25 ppm & ≤50 ppm
- Type 1C2: >25 ppm & ≤50 ppm
- Type 4A2: >25 ppm & ≤50 ppm

Most of the caulk materials requiring removal or stabilization were weathered and deteriorated, and the distinction between the degrees of weathering and deterioration were generally not significant enough to be used as meaningful criteria for prioritizing the removal or stabilization actions. As such, prioritization of the caulk removal or stabilization will be based on the PCB concentrations in the materials. Removal of caulks containing PCB concentrations > 50 ppm will be the highest priority, and stabilization of caulks containing PCB concentrations > 25 ppm and ≤ 50 ppm will be the second priority. However, in the event that efficiency can be achieved by performing removal and stabilization activities at the same time in similar areas, the efficiency factor will be considered in the prioritization of the work.

Proposed actions are presented in the following sections of this report.

3.4.1 Removal

Boeing will remove caulk materials containing > 50 ppm PCBs.

2-10 Area

East of Building 2-15 (Type 1A): Eighteen samples of Type 1A caulk were collected in the 2-10 Area east of Building 2-15. Based on PCB concentrations, twelve of the samples were designated as subset Type 1A1 (> 1 ppm and ≤ 25 ppm PCBs), four of the samples were designated as subset Type 1A3 (> 25 ppm and ≤ 50 ppm PCBs), and two of the samples were designated as subset Type 1A2 (>50ppm PCBs). The area containing the Type 1A2 caulk was bounded on the north by locations of adjacent samples of Type 1A caulk (subsets 1A1 and 1A3) that contained < 50 ppm PCBs. Boeing will remove the 240 linear feet of subset Type 1A2 in the subject area, as shown on Figure 7.

2-60s Area

2-62 Slab (Type 1A): Eleven samples of Type 1A caulk were collected on the 2-62 slab. Based on PCB concentrations, 6 of the samples were designated as subset Type 1A1 (> 1 ppm and ≤ 25 ppm), 4 of the samples were designated as subset Type 1A2 (> 50 ppm), and one of the samples was designated as subset Type 1A3 (> 25 ppm and ≤ 50 ppm). The locations of the subset Type 1A2 samples indicated that two areas on the slab contained caulk with

> 50 ppm PCBs. One area contained 440 linear feet of subset Type 1A2 caulk and the other area contained 490 linear feet of subset Type 1A2 caulk. The areas containing the Type 1A2 caulk were bounded by locations of adjacent samples of Type 1A caulk (subsets 1A1 and 1A3) that contained < 50 ppm PCBs. Boeing will remove the 930 linear feet of subset Type 1A2 caulk in the subject areas, as shown on Figure 8.

2-65 Slab (Type 1A): Three samples of Type 1A caulk were collected on the 2-65 slab. Based on PCB concentrations, one sample was designated as subset Type 1A1 (> 1 ppm and ≤ 25 ppm), one sample was designated as subset Type 1A2 (> 50 ppm), and one sample was designated as subset Type 1A3 (> 25 ppm and ≤ 50 ppm). The extents of the area containing the subset Type 1A2 caulk were limited. Boeing will remove the 50 linear feet of subset Type 1A2 caulk in the subject area, as shown on Figure 8.

3.4.2 Stabilization

Boeing will stabilize caulk materials containing >25 ppm and ≤ 50 ppm PCBs.

2-10 Area

East of Building 2-15 (Type 1A): Eighteen samples of Type 1A caulk were collected in an area on the east side of Building 2-15. Based on PCB concentrations, 12 of the 18 samples were designated as subset Type 1A1 (> 1 ppm and ≤ 25 ppm), 4 of the samples were designated as subset Type 1A3 (> 25 ppm and ≤ 50 ppm), and 2 of the samples were designated as subset Type 1A2 (>50ppm). The removal of the subset Type 1A2 caulk was addressed in Section 3.4.1. The area containing the Type 1A3 caulk was bounded on the south by the removal area for subset Type 1A2 caulk, and on north and east by samples of subset Type 1A1 caulk that contained less than 25 ppm PCBs. Boeing will stabilize the approximately 632 linear feet of subset Type 1A3 caulk in the subject area, as shown on Figure 7.

South of Building 2-10 (Type 1C): Six samples of Type 1C caulk were collected in an area on the south side of Building 2-10. Based on PCB concentrations, 5 of the 6 samples were designated as subset Type 1C1 (> 1 ppm and ≤ 25 ppm PCBs), and one of the samples was designated as subset Type 1C2 (> 25 ppm and ≤ 50 ppm PCBs). The area containing the Type 1C2 caulk was bounded by locations of adjacent samples of subset Type 1C1 caulk. Boeing will stabilize the 348 linear feet of subset Type 1C2 caulk in the subject area, as shown on Figure 7.

Under 16th Ave South Bridge (Type 1C): Eight samples of Type 1C caulk were collected in an area generally located under the 16th Avenue South Bridge. Based on PCB concentrations, 5 of the 8 samples were designated as subset Type 1C1 (> 1 ppm and ≤ 25 ppm PCBs), and 3 of the samples were designated as subset Type 1C2 (> 25 ppm and ≤ 50 ppm PCBs). The area containing the Type 1C2 caulk was bounded by locations of adjacent samples of subset Type 1C1 caulk. Boeing will stabilize the 317 linear feet of subset Type 1C2 caulk in the subject area, as shown on Figure 7.

2-60s Area

2-62 Slab (Type 1A): Eleven samples of Type 1A caulk were collected on the 2-62 slab. Based on PCB concentrations, 6 of the samples were designated as subset Type 1A1 (> 1 ppm and ≤ 25 ppm), 4 of the samples were designated as subset Type 1A2 (> 50 ppm), and one of the samples was designated as subset Type 1A3 (> 25 ppm and ≤ 50 ppm). The removal of the Type 1A2 caulk was addressed in Section 3.4.1. The area containing the subset Type 1A3 caulk was bounded by locations of adjacent samples of subset Types 1A1 and 1A2 caulk. Boeing will stabilize the 110 linear feet of subset Type 1A3 caulk in the subject area, as shown on Figure 8.

2-62 Slab (Type 4A): No samples of Type 4A caulk were collected on the 2-62 slab, and the small quantity of Type 4A caulk found in two areas on that slab was conservatively designated as subset Type 4A2 (> 25 ppm and ≤ 50 ppm). Boeing will stabilize the 30 linear feet of subset Type 4A2 caulk found in two areas on that slab, as shown on Figure 8.

2-63 Slab (Type 4A): No samples of Type 4A caulk were collected on the 2-63 slab, and the Type 4A caulk found on that slab was conservatively designated as subset Type 4A2 (> 25 ppm and ≤ 50 ppm). Boeing will stabilize the 128 linear feet of subset Type 4A2 caulk on that slab, as shown on Figure 8.

2-65 Slab (Types 1A, 1C, & 4A): Eleven samples of Types 1A, 1C and 4A caulk were collected on the 2-65 slab, including 3 samples of Type 1A, one sample of Type 1C, and 7 samples of Type 4A. The Type 1A samples, based on PCB concentrations, included one sample of subset Type 1A1 (> 1 ppm and ≤ 25 ppm), one sample of subset Type 1A2 (> 50 ppm), and one sample of subset Type 1A3 (> 25 ppm and ≤ 50 ppm). The Type 1C sample, based on its PCB concentration, was designated as subset Type 1C2 (> 25 ppm and ≤ 50 ppm). The Type 4A samples, based on PCB concentrations, included 4 samples of subset Type 4A1 (> 1 ppm and ≤ 25 ppm) and 3 samples of subset Type 4A2 (> 25 ppm and ≤ 50 ppm). The subset Type 1A2 caulk was addressed in Section 3.4.1. The area on the 2-65 slab containing caulk with PCB concentrations > 25 ppm and ≤ 50 ppm (subset Types 1A3, 1C2, and 4A2) was bounded by locations of adjacent samples of caulks that contained less than 25 ppm PCBs. The lengths of joints containing the caulks in the subject area included 55 linear feet of subset Type 1A3, 45 linear feet of subset Type 1C2, and 250 linear feet of subset Type 4A2. Boeing will stabilize the 350 linear feet of subset caulk Types 1A3, 1C2, and 4A2 in the subject area, as shown on Figure 8.

2-66 Slab (Types 1C & 4A): Three samples of Type 1C caulk and 2 samples of Type 4A caulk were collected on the 2-66 slab. Based on PCB concentrations, 2 of the Type 1C samples were designated as subset Type 1C1 (> 1 ppm and ≤ 25 ppm) and the other Type 1C sample was designated as subset Type 1C2 (> 25 ppm and ≤ 50 ppm). One of the Type 4A samples was designated as subset Type 4A1 (> 1 ppm and ≤ 25 ppm), and one of the Type 4A samples was designated as subset Type 4A2 (> 25 ppm and ≤ 50 ppm). As such, two areas were identified on the 2-66 slab as containing caulk with PCB concentrations > 25 ppm and ≤ 50 ppm. The

area containing the subset Type 1C2 caulk is located on the west edge of the slab. Most of the Type 4A caulk on the 2-66 Slab was conservatively designated as subset Type 4A2, and the area containing that caulk therefore includes most of the slab. Boeing will stabilize the 13 linear feet of subset Type 1C2 caulk and the 915 linear feet of subset Type 4A2 caulk in the subject areas of the 2-66 slab as shown on Figure 8.

3.5 Discussion: Removal or Stabilization Methods

Following EPA approval of this Phase 2 report and conceptual work plan, a Phase 3 work plan will be submitted to detail the specific methods and schedule proposed for caulk removal or stabilization, in accordance with the areas identified for these actions in the Phase 2 report. The Phase 3 work plan will be developed in such a manner that safety, efficiency, effectiveness, and minimizing impacts on operations will be assured. Potential methods currently being considered for the Phase 3 removal or stabilization of caulk materials are discussed below.

3.5.1 Removal

Caulk materials characterized as containing PCB concentrations greater than 50 ppm will require removal. Potential methods of caulk removal currently being considered range from manual or mechanical removal of caulk joints to mass demolition and removal of the concrete containing the caulk. Different removal methods may be used in different areas of Plant 2, and combinations of methods may be employed as needed to minimize interruption to ongoing operations.

3.5.2 Stabilization

Caulk materials characterized as containing PCB concentrations between 25 ppm and 50 ppm will require stabilization. A potential method of caulk stabilization currently being considered includes the manual cleaning of the joints and cracks, and the application of a layer of hot tar on joints and cracks to seal the caulk material. Stabilization measures will require the development and implementation of an Operation and Maintenance Plan (O & M Plan) for monitoring and repairing stabilized areas.

3.6 Stormwater System and Caulk Discussion

The mapped locations of the PCB concentrations in caulk samples were compared to the mapped locations of PCB concentrations in recent stormwater system suspended solids samples. The comparison was made to evaluate whether the PCBs in the caulk materials were potentially affecting stormwater quality in the areas of the caulk study. The stormwater suspended solids sampling results were previously reported to EPA in the Stormwater Source Control Round 1 Sampling Report 2006-2007, dated October 2007 (Golder 2007b) and the Stormwater Source Control Round 2 Sampling Report, dated September 2008 (Golder 2008c).

A map of the stormwater system was overlaid on a map of the caulk sample results to assist in this evaluation of potential cause-and-effect. The map is presented as Figure 9, and includes

the analytical results of PCBs in the caulk in the 2-10, 2-40s and 2-60s Areas of Plant 2 and the source control analytical results for PCBs in suspended solids at stormlines B, I, J, and Z. The evaluation of caulk sampling results versus stormwater sampling results was not a useful factor in the recommendations for caulk removal or stabilization presented in this report. Below are brief discussions of observations regarding the stormlines and the caulk PCB concentrations in the stormline drainage basins.

Stormline B is located in the 2-10 Area and provides drainage around Buildings 2-120, 2-123, and the north and northeast sides of Building 2-10. Round 1 and round 2 source control sampling of suspended solids at manhole number 3-307 resulted in the detection of 2.4 ppm and 1.3 ppm PCBs respectively. Analytical results for eleven caulk samples in the drainage basin of Stormline B indicated PCB concentrations ranging from non-detect to 14.5 ppm. No definitive association was evident in the comparison of the caulk PCB concentrations to the stormline suspended solids PCB concentrations in Stormline B.

Stormline I is located in the 2-10 Area and provides drainage on the south side of Buildings 2-10 and 2-15, on the east side of Building 2-15, and between Buildings 2-10 and 2-15. Round 1 and round 2 source control sampling of suspended solids at manhole number 4-283 resulted in the detection of 5.4 ppm and 6.2 ppm PCBs respectively. Analytical results for approximately sixty caulk samples in the drainage basin of Stormline I indicated PCB concentrations ranging from non-detect to 180 ppm. Figure 7 shows one area where caulk removal is recommended as a result of PCB concentrations higher than 50 ppm, and 3 areas where caulk stabilization is recommended as a result of PCB concentrations between 25 ppm and 50 ppm. Although no definitive association was evident in the comparison of the caulk PCB concentrations to the stormline suspended solids PCB concentrations, the elevated PCB concentrations in the caulk in these areas may possibly be affecting the stormwater quality in Stormline I.

Stormline J is located in the 2-40s Area and provides drainage on the north side of Buildings 2-31, 2-25, and 2-22, and on the east side of Buildings 2-25 and 2-22. Round 1 and round 2 source control sampling of solids at manhole number 18-249 resulted in the detection of 6.4 ppm and 2.1 ppm PCBs respectively, and round 2 source control sampling of solids at manhole 18-505A resulted in the detection of 0.7 ppm PCBs. Suspended solids were not sampled at this manhole during round 1. Analytical results for three caulk samples in the drainage basin of Stormline J indicated PCB concentrations ranging from non-detect to 3.4 ppm. No definitive association was evident in the comparison of the caulk PCB concentrations to the stormline suspended solids PCB concentrations in Stormline J

Stormline Z is located in the 2-40s, 2-60s, and South Yard Areas of Plant 2, and provides drainage on the east side of Building 2-40, in most of the 2-60s Area, and in all of the South Yard. Caulk samples were collected in the 2-40s and 2-60s Areas, and the assessment of a possible association between the caulk PCB concentrations and the stormwater suspended solids PCB concentrations is limited to the 2-40s and 2-60s Areas. Round 1 and round 2 source control sampling of suspended solids at manhole number 36-131 resulted in the detection of 1.9 ppm and 1.4 ppm PCBs respectively. Analytical results for 135 caulk samples collected in the

2-40s & 2-60s drainage basin portion of Stormline Z indicated PCB concentrations ranging from non-detect to 40,500 ppm. The 2-62, 2-63, 2-65, and 2-66 slabs contain caulks that require removal (>50 ppm PCBs) or stabilization (25 – 50 ppm PCBs) as shown on Figure 8. Although no definitive association was evident in the comparison of the caulk PCB concentrations to the stormline suspended solids PCB concentrations, the elevated PCB concentrations in the caulk in these areas may possibly be affecting the stormwater quality in Stormline Z.

In summary, no definitive association was evident when comparing stormline data to caulk data. Improvements in the stormwater quality could possibly be realized after implementation of the caulk removal and stabilization recommendations. However, Boeing does expect substantial improvement in stormwater quality following the jet cleaning of the stormwater system that has been performed parallel to caulk sampling during the summer and fall of 2008.

4.0 PHASE 3 WORK PLAN

Following EPA approval of the Phase 2 Report and Work Plan, a Phase 3 Work Plan will be submitted. The Phase 3 Work Plan will detail the specific areas, methods and schedule proposed for caulk removal or stabilization in accordance with the recommendations presented in the Phase 2 report.

5.0 SCHEDULE

Phase 3 of the IM Work Plan includes removal or stabilization of caulk materials containing more than 25 ppm PCBs in the 2-10 and 2-60s Areas of Plant 2, in accordance with the recommendations presented in the Phase 2 Report and Work Plan. The schedule for Phase 3 is presented below.

Phase	Description	Due Date
Phase 3	Prepare Work Plan for caulk removal/stabilization.	Submit within 45 days after EPA approval of Phase 2 Report.*
	Remove or stabilize caulk materials. Work must be performed during dry seasons.	Boeing intends to start implementation during the 2009 dry season, pending timely EPA approval. Detailed schedule to be provided with Phase 3 Work Plan.

* Forty-five days will be required to submit the Phase 3 Work Plan after approval of the Phase 2 Report and Work Plan due to planning required to explore and confirm viability of removal or stabilization methods and planning required to minimize impacts to operations.

6.0 REFERENCES

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TABLES

Table 1 - Plant 2 Caulk Sampling Summary - Sorted by Area, Caulk Type, and PCB Concentration

CAULK TYPE	COLOR	DESCRIPTION	PCB Concentration Category (ppm)	2-10 Area		2-40s Area		2-60s/2-66 Area	
				PCB Range (ppm)	No. of Samples	PCB Range (ppm)	No. of Samples	PCB Range (ppm)	No. of Samples
1A1	Dull black	Stiff - hard. Fresh surface black, glassy, rough, crumbly	> 1.0 & ≤ 25.0	0.73U - 24.8	41	0.79U - 10.3	10	0.79U - 18.6	25
1A2	Same as 1A1, but anomalous elevated PCB concentrations > 50 ppm, located on 2-62 Slab & near Bldg 2-64 & E side of Bldg 2-15		> 50.0	54 - 180	2	NA	0	66 - 39000	6
1A3	Same as 1A1, but with concentrations >25 ppm & ≤ 50 ppm		> 25.0 & ≤ 50.0	25.5 - 44	4	NA	0	46 - 48	2
1B	Dull black	Stiff - hard, brittle. Fresh surface black, glassy, concoidal fracture.	> 1.0 & ≤ 25.0	0.79U - 7.2	8	0.79U - 5.0	6	2.5 - 8.1	4
1C1	Dull black	Type 1A, but includes metal shavings, small screws, etc. in caulk matrix	> 1.0 & ≤ 25.0	5.6 - 24.0	11	5.6 - 12.3	5	2.2 - 24.0	7
1C2	Dull black	Type 1A, but includes metal shavings, small screws, etc. in caulk matrix	> 25.0 & ≤ 50.0	29 - 42	4	NA	0	31.1 - 44	2
1D	Dull black	Same as Type 1A, but pliable to semi-pliable. Fresh surface black, glassy, rough	> 1.0 & ≤ 25.0	NA	0	8.3	1	NA	0
1E	Dull black	Soft - stiff, pliable - semi-piable. Fresh surface dull - semi glossy black, smooth - rough.	> 1.0 & ≤ 25.0	0.79U - 2.5	4	0.79U - 3.0	15	0.79U - 1.4	3
2A	Light gray	Soft - stiff, pliable, spongy - rubbery	> 1.0 & ≤ 25.0	0.8U - 2.0U	3	0.79U - 1.6Y	3	0.8U	3
2B	Light gray	Strong, very stiff - very hard, brittle	≤ 1.0	0.8U	1	NA	0	NA	0
2C	Dull gray	Stiff - hard, pliable	≤ 1.0*	NA	0	0.79U	1	29300 - 40500	2
3	Brown to Black	Soft - firm, pliable & spongy	> 1.0 & ≤ 25.0	0.79U - 0.8U	2	NA	0	0.8U - 2.2	2
4A1	Dull, gray to brownish-black	Soft, friable, course fibrous, wood-like appearance	> 1.0 & ≤ 25.0	NA	0	NA	0	2.3 - 22.5	7
4A2	Same as 4A1, but with concentrations >25 ppm & ≤ 50 ppm		> 25.0 & ≤ 50.0	NA	0	NA	0	27 - 34000	4
4B	Dull, brown to brownish-black	Soft to stiff, friable, fibrous. Fine to med light tan fibers. Peat moss-like appearance	> 1.0 & ≤ 25.0	0.71U - 1.2U	6	NA	0	0.67U - 22.8	6
4C	Dull, brown to brownish-black	Friable, platy, stiff to semi-hard, brittle. Fine light tan fibers, slate-like appearance.	> 1.0 & ≤ 25.0	11.0	1	0.71U	1	0.71U - 15.6	7
5	Brown	Soft, pliable, spongy, stretchy, sticky	> 1.0 & ≤ 25.0	NA	0	NA	0	9.6Y - 9.9Y	5
6	Reddish brown to black	Stiff, semi-pliable. Fresh surface smooth, yellow/brown/orange	> 1.0 & ≤ 25.0	NA	0	NA	0	6.2 - 10.0	3
7	Amber	Smooth, translucent, very hard, glassy	> 1.0 & ≤ 25.0	0.79U - 3.2	2	NA	0	NA	0
8A	White	Soft - stiff, pliable, spongy	> 1.0 & ≤ 25.0	NA	0	NA	0	7.8Y	3
8B	White	Firm - stiff, finely wrinkled, cracked. Fresh surface smooth, dull grayish-white	> 1.0 & ≤ 25.0	NA	0	NA	0	1.6 - 2.7	2
* PCB Concentration Category assigned for mapping purposes in the *Phase 1 Report and Work Plan*			Totals		89		42		93

CAULK TYPE	SAMPLE NUMBER*	GENERAL CONDITION OF CAULK IN JOINT	PCBs (ppm)	Q	COMMENTS
2-10 AREA SAMPLES					
1A1	*PL2IM-2-10-19-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.73	U	
1A1	*PL2IM-2-10-29-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.74	J	
1A1	*PL2IM-2-10-11-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.77	U	
1A1	PL2IM-2-10-05-05-C	Poor, weathered/eroded, dirt & moss infilled	0.79	U	
1A1	*PL2IM-2-10-03-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.79	U	
1A1	*PL2IM-2-10-13-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.79	U	
1A1	*PL2IM-2-10-33-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.79	U	
1A1	*PL2IM-2-10-51-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1" depth	0.79	U	
1A1	*PL2IM-2-10-37-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.80	U	
1A1	*PL2IM-2-10-09-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.97		
1A1	*PL2IM-2-10-73-03-C (Dup of 10-73-02)*	Good at sampling location around column, but weathered/eroded elsewhere	1.10		
1A1	*PL2IM-2-10-73-02-C*	Good at sampling location around column, but weathered/eroded elsewhere	1.20		
1A1	*PL2IM-2-10-19-02-C (Dup of 10-19-01)*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	2.10		
1A1	*PL2IM-2-10-61-01-C*	Fair, squeezing out of foundation joint around building	2.60		
1A1	*PL2IM-2-10-53-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	2.77		
1A1	PL2IM-2-10-20-02-C	Poor, weathered/eroded in most areas	3.30		
1A1	*PL2IM-2-10-07-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	3.40		
1A1	*PL2IM-2-10-79-01-C*	Good, squeezing out of foundation joint around building	3.44		
1A1	*PL2IM-2-10-17-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	3.60		
1A1	*PL2IM-2-10-23-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	3.60		
1A1	*PL2IM-2-10-59-02-C*	Fair to poor	3.70		
1A1	*PL2IM-2-10-17-02-C (Dup of 10-17-01)*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	4.20		MS/MSD
1A1	PL2IM-2-10-20-01-C	Fair, weathered/eroded in some areas	4.60		
1A1	*PL2IM-2-10-63-01-C*	Fair, partially weathered, moss and dirt infilled	5.40		
1A1	PL2IM-2-10-20-01A-C (Dup of 10-20-01)	Fair, weathered/eroded in some areas	5.60		
1A1	*PL2IM-2-10-57-01-C*	Fair	6.30		
1A1	*PL2IM-2-10-35-01-C*	Poor, most joints in area severely weathered & almost completely eroded	6.50		
1A1	PL2IM-2-10-44-03-C	Poor, some caulk missing from joint	7.60		
1A1	*PL2IM-2-10-01-02-C*	Poor, mostly weathered/eroded at surface, better condiiion at 1/2" depth	8.00		
1A1	*PL2IM-2-10-41-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	8.40		
1A1	PL2IM-2-10-60-03-C	Fair, cracking	8.50		
1A1	*PL2IM-2-10-41-02-C (Dup of 10-41-01)*	Poor, partially to mostly weathered/eroded from most joints in sampling area	9.90		MS/MSD
1A1	*PL2IM-2-10-45-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	9.90		
1A1	*PL2IM-2-10-15-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	10.60		
1A1	*PL2IM-2-10-21-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	10.90		
1A1	PL2IM-2-10-05-03-C	Poor, weathered/eroded, dirt & moss infilled	11.30		
1A1	PL2IM-2-10-60-02A-C (Dup of 10-60-02)	Poor, weathered/eroded in many areas	11.90		
1A1	PL2IM-2-10-60-02-C	Poor, weathered/eroded in many areas	12.40		

Table 1 - Plant 2 Caulk Sampling Summary - Sorted by Area, Caulk Type, and PCB Concentration

CAULK TYPE	SAMPLE NUMBER*	GENERAL CONDITION OF CAULK IN JOINT	PCBs (ppm)	Q	COMMENTS
1A1	PL2IM-2-10-05-02-C	Poor, partially weathered/eroded, dirt & moss infilled	14.50		
1A1	*PL2IM-2-10-31-01-C*	Poor, most joints in area severely weathered & almost completely eroded	17.80		
1A1	*PL2IM-2-10-27-01-C*	Poor, mostly weathered/eroded in most areas	24.80		
1A2	*PL2IM-2-10-49-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	54.00		
1A2	*PL2IM-2-10-39-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	180.00		
1A3	*PL2IM-2-10-39-03-C*	Poor, mostly weathered/eroded from joints, very little caulk in joints	25.50		
1A3	*PL2IM-2-10-39-05-C*	Poor, mostly weathered/eroded from joints in area	29.00		
1A3	*PL2IM-2-10-39-04-C*	Fair to poor, fair in this joint, but poor in surrounding joints, weathered/eroded	41.00		
1A3	*PL2IM-2-10-40-04-C*	Fair to poor, weathered/eroded at surface, better condition at 1/2" depth	44.00		
1B	PL2IM-2-10-55-03-C	Fair, partially weathered/eroded, dirt & moss infilled	0.79	U	
1B	PL2IM-2-10-32-01-C	Fair, some weathering/erosion	0.80	U	
1B	PL2IM-2-10-32-02-C	Fair, partially eroded in most areas	0.80	U	
1B	PL2IM-2-10-40-02-C	Poor, weathered/eroded in most areas, dirt & moss infilled.	0.80	U	
1B	PL2IM-2-10-40-03-C	Poor, weathered/eroded in most areas, dirt & moss infilled.	0.80	U	
1B	PL2IM-2-10-75-01-C	Fair, some cracking & weathering/erosion	3.80		
1B	PL2IM-2-10-75-02-C (Dup of 10-75-01)	Fair, some cracking & weathering/erosion	4.80		
1B	PL2IM-2-10-44-02-C	Poor, weathered/eroded in most areas; dirt, moss & grass infilled.	7.20		
1C1	*PL2IM-2-10-73-01-C*	Good at sample location, but partially weathered/eroded elsewhere in area	5.55		
1C1	*PL2IM-2-10-29-02-C*	Fair, partially weathered/eroded	7.50		
1C1	*PL2IM-2-10-59-04-C (Dup of 10-59-03)*	Fair, only partially weathered/eroded	12.40		MS/MSD
1C1	*PL2IM-2-10-59-05-C*	Fair to poor, partially weathered/eroded from joint	14.20		
1C1	*PL2IM-2-10-72-02-C*	Fair, minor weathering/erosion	16.80		
1C1	*PL2IM-2-10-59-01-C*	Fair to poor, significantly weathered/eroded in some areas	16.90		
1C1	*PL2IM-2-10-59-03-C*	Fair, only partially weathered/eroded	17.30		
1C1	*PL2IM-2-10-71-01-C*	Fair, partially weathered	18.80		
1C1	*PL2IM-2-10-64-01-C*	Fair to poor, partially weathered/eroded from joint	23.00		
1C1	*PL2IM-2-10-77-01-C*	Fair to good, some cracking, weathering & erosion	23.00		
1C1	*PL2IM-2-10-72-03-C*	Fair, only partially weathered/eroded	24.00		
1C2	PL2IM-2-10-75-04-C	Fair to poor, weathered/eroded in many areas	29.00		
1C2	PL2IM-2-10-75-03-C	Good	36.10		
1C2	PL2IM-2-10-65-02-C	Poor, weathered/eroded in many areas, dirt & rock infilled	40.00		
1C2	*PL2IM-2-10-72-01-C*	Fair to poor, weathered/partially eroded in some areas	42.00		
1E	PL2IM-2-10-80-01-C	Excellent	0.79	U	
1E	PL2IM-2-10-55-04-C	Fair, little to no weathering/erosion	0.80	U	
1E	PL2IM-2-10-80-02-C	Excellent	1.10		
1E	PL2IM-2-10-65-01-C	Good	2.50		
2A	PL2IM-2-10-05-04-C	Excellent	0.80	U	
2A	PL2IM-2-10-20-03-C	Excellent	1.90	U	
2A	PL2IM-2-10-20-04-C (Dup of 10-20-03)	Excellent	2.00	U	
2B	PL2IM-2-10-44-01-C	Fair, cracked & broken-out in some areas.	0.80	U	
3	PL2IM-2-10-55-02-C	Good	0.79	U	
3	PL2IM-2-10-55-01-C	Good	0.80	U	
4B	*PL2IM-2-10-75-05-C*	Fair to good	0.71	U	
4B	*PL2IM-2-10-44-04-C*	Good	0.72	U	
4B	*PL2IM-2-10-55-05-C*	Fair	0.79	U	
4B	*PL2IM-2-10-75-06-C (Dup of 10-75-05)*	Fair to good	0.90	U	MS/MSD
4B	*PL2IM-2-10-65-04-C (revised)*	Fair	0.98		revised from PL2IM-2-10-65-03
4B	*PL2IM-2-10-20-05-C*	Excellent	1.20	U	
4C	*PL2IM-2-10-44-05-C*	Fair	11.00		
7	PL2IM-2-10-65-03-C	Fair, cracked, used in spot treatments only, very limited distribution	0.79	U	
7	PL2IM-2-10-60-01-C	Fair, cracked, used in spot treatments only, very limited distribution	3.20		
2-40s AREA SAMPLES					
1A1	PL2IM-2-40-06-03-C	Poor, highly weathered/eroded, dirt & moss infilled	0.79	U	
1A1	*PL2IM-2-40-11-01-C*	Fair to good	0.79	U	
1A1	PL2IM-2-40-08-01-C	Poor, highly weathered/eroded, dirt & moss infilled	0.92		
1A1	PL2IM-2-40-06-02-C	Fair, some weathering/erosion, dirt & moss infilled	0.99		
1A1	*PL2IM-2-40-25-01-C*	Poor, mostly weathered/eroded at surface; dirt, moss & grass infilled	1.40		
1A1	*PL2IM-2-40-31-01-C*	Poor, mostly weathered/eroded from joints in sampling area; dirt infilled	2.60		
1A1	*PL2IM-2-40-15-04-C*	Poor, mostly weathered/eroded at surface; dirt & grass infilled	2.80		
1A1	PL2IM-2-40-01-02-C	Fair, some weathering/erosion	7.50		
1A1	*PL2IM-2-40-17-01-C*	Poor, mostly weathered/eroded at surface; dirt & grass infiilled	7.50		
1A1	PL2IM-2-40-16-02-C	Poor, caulk only half fills joint, weathered/eroded; dirt, moss & grass infilled	10.30		
1B	PL2IM-2-40-24-02-C	Good	0.79	U	
1B	PL2IM-2-40-15-02-C	Poor, mostly weathered/eroded, dirt & moss infilled	0.80	U	
1B	PL2IM-2-40-24-03-C	Poor, weathered/eroded in many areas	0.80	U	
1B	PL2IM-2-40-24-04-C (Dup of 40-24-03)	Poor, weathered/eroded in many areas	0.80	U	
1B	PL2IM-2-40-18-01-C	Poor, weathered/eroded in many areas; dirt, moss & grass infilled	3.10		

Table 1 - Plant 2 Caulk Sampling Summary - Sorted by Area, Caulk Type, and PCB Concentration

CAULK TYPE	SAMPLE NUMBER*	GENERAL CONDITION OF CAULK IN JOINT	PCBs (ppm)	Q	COMMENTS
1B	PL2IM-2-40-09-01-C	Fair to poor, weathered/eroded in some areas	5.00		
1C1	*PL2IM-2-40-21-01-C*	Fair, some weathering/erosion; partially infilled with dirt & grass	5.60		
1C1	PL2IM-2-40-18-02-C	Good to fair	7.80		
1C1	PL2IM-2-40-19-03-C	Fair to good, slightly weathered/eroded	9.20		
1C1	*PL2IM-2-40-23-01-C*	Poor, mostly weathered/eroded; infilled with dirt & grass	12.00		
1C1	PL2IM-2-40-19-03A-C (Dup of 40-19-03)	Fair to good, slightly weathered/eroded	12.30		
1D	PL2IM-2-40-16-01-C	Fair, some areas weathered/eroded	8.30		
1E	PL2IM-2-40-06-01-C	Good to fair, some dirt & moss infilling	0.79	U	
1E	PL2IM-2-40-08-02-C	Good, only slightly weathered	0.79	U	
1E	PL2IM-2-40-09-02-C	Good	0.79	U	
1E	PL2IM-2-40-10-03-C	Good	0.79	U	
1E	PL2IM-2-40-08-03-C (Dup of 40-08-02)	Good, only slightly weathered	0.80	U	
1E	PL2IM-2-40-19-02A-C (Dup of 40-19-02)	Good	0.80	U	
1E	PL2IM-2-40-15-01-C	Good	0.82		
1E	PL2IM-2-40-15-03-C	Good, slightly weathered	0.88		
1E	PL2IM-2-40-09-03-C	Good	0.89		
1E	PL2IM-2-40-10-04-C	Good	0.95		
1E	PL2IM-2-40-19-02-C	Good	1.10		
1E	PL2IM-2-40-09-05-C (Dup of 40-09-04)	Good	1.30		
1E	PL2IM-2-40-09-04-C	Good	1.40		
1E	PL2IM-2-40-10-01-C	Fair	1.50		
1E	PL2IM-2-40-10-02-C	Fair, weathered	3.00		
2A	PL2IM-2-40-01-03-C	Good	0.79	U	
2A	PL2IM-2-40-01-04-C	Fair, rubbery, easily pulled from joint	0.79	U	
2A	PL2IM-2-40-01-05-C	Fair, rubbery, easily pulled from joint	1.60	Y	
2C	PL2IM-2-40-01-01-C	Good, slightly weathered	0.79	U	
4C	*PL2IM-2-40-31-02-C*	Fair	0.71	U	Sample No. revised from PL2IM-2-40-31-01-C
2-60s/2-66 AREA SAMPLES					
1A1	PL2-JM-Y-214-6	Poor, weathered/eroded, some dirt & moss infilling. Limited distribution in area.	0.79	U	
1A1	*PL2IM-2-60-05-01-C*	Poor, mostly weathered/eroded in area; infilled with dirt, moss & grass	0.79	U	
1A1	PL2-JM-X-215-3	Removed	0.80	U	Removed during recent construction activities
1A1	*PL2IM-2-60-03-01-C*	Poor, mostly weathered/eroded in area; infilled with dirt, moss & weeds	1.4		
1A1	PL2-JM-X-215-2	Removed	1.81	J	Removed during recent construction activities
1A1	*PL2IM-2-60-73-02-C*	Fair to poor, weathering & some erosion	3.90		
1A1	PL2-JM-Y-226-1	Fair, moderately weathered/eroded, dirt & moss infilled. Limited distribution in area.	4.00		
1A1	*PL2IM-2-60-49-01-C*	Fair to poor, weathered and eroding	4.02		
1A1	*PL2IM-2-60-21-01-C*	Poor, mostly weathered/eroded from joints in sampling area	4.50		
1A1	*PL2IM-2-60-19-02-C (Dup of 60-19-01)*	Fair	5.40		MS/MSD
1A1	*PL2IM-2-60-01-01-C*	Good at sample location, but poor elasewhere in the area	7.10		
1A1	*PL2IM-2-60-19-01-C*	Fair	7.30		
1A1	*PL2IM-2-60-09-02-C*	Fair, squeezing out of foundation joint around building	7.50		
1A1	*PL2IM-2-60-11-02-C*	Fair to poor, generally weathered out of foundation joint; infilled with dirt & moss	8.10		
1A1	PL2-JM-Y-214-8	Poor, weathered/eroded, dirt & moss infilled. Limited distribution in area.	12.90		
1A1	PL2-JM-X-215-7	Good, minor weathering. Common distribution in area.	13.00		
1A1	*PL2IM-2-60-07-01-C*	Fair to poor, mostly weathered/eroded from joints in area; infilled with dirt & moss	13.00		
1A1	*PL2IM-2-60-23-01-C*	Fair, squeezing out of foundation joint around building	14.20		
1A1	*PL2IM-2-60-35-01-C*	Fair	18.60		
Type 1A1 samples located on 2-62 Slab					
1A1	PL2-JM-Z-207-2	Poor, weathered/eroded. Common distribution in area.	1.70		Located on 2-62 Slab
1A1	PL2-JM-Z-207A-1	Poor, weathered/eroded, dirt & moss infilled. Common distribution in area.	4.10		Located on 2-62 Slab
1A1	PL2-JM-Z-207A-2 (Dup of 207A-1)	Poor, weathered/eroded, dirt & moss infilled. Common distribution in area.	5.10		Located on 2-62 Slab
1A1	PL2-JM-Z-207A-3	Poor, weathered/eroded. Common distribution in area.	5.60		Located on 2-62 Slab
1A1	PL2-JM-Z-207-1	Poor, eroded & cracked, dirt & moss infilled. Common distribution in area.	10.30		Located on 2-62 Slab
1A1	*PL2IM-2-60-81-01-C*	Fair to poor, weathering & starting to erode from joint	12.50		
Type 1A2 samples located on 2-62 Slab or near PCB RCRA Unit & containing elevated concentrations of PCBs					
1A2	PL2-JM-Z-212-3 (Dup of 212-2)	Poor, weathered/eroded; dirt, moss & grass infilled. Common distribution in area	68.00		Located on 2-62 Slab
1A2	PL2-JM-Z-212-2	Poor, weathered/eroded; dirt, moss & grass infilled. Common distribution in area	110.00		Located on 2-62 Slab
1A2	PL2-JM-X-215-1	Removed	740.00		Removed from 2-64 during recent construction activities
1A2	PL2-JM-Y-204-1	Fair, weathered, dirt & moss infilling. Common distribution in area.	29000.00		Located on 2-62 Slab
1A2	PL2-JM-Z-735-1	Poor, weathered/eroded, dirt, moss & grass infilled. Limited distribution in area.	39000.00		Located on 2-62 Slab
Type 1A2 sample located on 2-65 Slab					
1A2	*PL2IM-2-60-37-01-C*	Fair	66.00		
Type 1A3 samples located on 2-65 Slab					
1A3	PL2-JM-Z-210-1	Poor, eroded & cracked, dirt & moss infilled. Common distribution in area.	45.80	J	Located on 2-62 Slab, reclassified to 1A2 from 1A3
1A3	*PL2IM-2-60-45-01-C*	Good	48.00		
1B	PL2-JM-X-233-1	Poor - Fair, weathered/eroded, dirt infilled. Common distribution in area.	2.50		
1B	PL2-JM-Y-214-1	Poor - Fair, some weathering/erosion, dirt & moss infilled. Common distribution in area.	2.50		

Table 1 - Plant 2 Caulk Sampling Summary - Sorted by Area, Caulk Type, and PCB Concentration

CAULK TYPE	SAMPLE NUMBER*	GENERAL CONDITION OF CAULK IN JOINT	PCBs (ppm)	Q	COMMENTS
1B	PL2-JM-Y-214-2	Removed	2.70		Removed during recent construction activities
1B	PL2-JM-X-215-4	Fair, some weathering/erosion, dirt & moss infilled. Limited distribution in area.	8.10		
1C1	*PL2IM-2-60-87-01-C*	Good	2.17		
1C1	*PL2IM-2-60-09-01-C*	Good	2.40		
1C1	*PL2IM-2-60-73-01-C*	Fair	2.57		
1C1	*PL2IM-2-60-19-03-C*	Fair	5.30		
1C1	*PL2IM-2-60-15-01-C*	Fair, partially to mostly covered by mortar & Type 7 caulk	5.70		
1C1	*PL2IM-2-60-53-01-C*	Fair to good	18.60		
1C1	*PL2IM-2-60-47-01-C*	Fair	24.00		
1C2	*PL2IM-2-60-45-02-C*	Fair to good	31.10		
1C2	*PL2IM-2-60-11-01-C*	Fair	44.00		
1E	PL2-JM-Z-212-4 (Dup of 212-1)	Fair, cracked/segmented. Common distribution on area roads.	0.79	U	
1E	PL2-JM-Z-212-1	Fair, cracked/segmented. Common distribution on area roads.	1.20	U	
1E	PL2-JM-Z-154-2	Poor - Fair, cracked/segmented. Common distribution on area roads.	1.40		
2A	PL2-JM-V-189-1	Good. Common distribution in area.	0.80	U	
2A	PL2-JM-Z-213-1	Good. Common distribution in area.	0.80	U	
2A	PL2-JM-Z-706-1	Good. Common distribution in area.	0.80	U	
2C	PL2-JM-Y-214-3	Removed	29300.00	J	Voluntarily removed by Boeing
2C	PL2-JM-Y-214-4	Removed	40500.00	J	Voluntarily removed by Boeing
3	PL2-JM-V-188-1	Fair - Good, moss covered. Limited distribution in area.	0.80	U	
3	PL2-JM-Z-138-1	Good. Common distribution in area.	2.20	J	
4A1	*PL2IM-2-60-07-02-C*	Fair to good	2.30		
4A1	PL2-JM-X-215-6	Fair, little weathering/erosion, dirt infilled. Common distribution in area.	5.20		
4A1	*PL2IM-2-60-39-01-C*	Fair to good.	5.60		
4A1	PL2-JM-Y-214-5	Fair, some weathering/erosion, dirt infilled. Common distribution in area.	8.60		
4A1	PL2-JM-Y-225-1	Poor, highly weathered/eroded; dirt & moss infilled. Limited-common distribution.	13.90		
4A1	PL2-JM-X-215-5	Removed	13.90		Removed during recent construction activities
4A1	*PL2IM-2-60-37-03-C*	Good	22.50		
4A2	PL2-JM-X-233-2	Fair, moderately weathered/eroded. Common distribution in area.	27.00		
4A2	*PL2IM-2-60-43-01-C*	Fair to good.	27.60		
4A2	*PL2IM-2-60-45-03-C*	Fair to good	29.00		
4A2	PL2-JM-Y-214-10	Removed	34000.00		Voluntarily removed by Boeing
4B	*PL2IM-2-60-96-01-C*	Excellent	0.67	U	
4B	*PL2IM-2-60-21-03-C*	Fair to good.	0.88		
4B	*PL2IM-2-60-45-04-C*	Good	3.30		
4B	*PL2IM-2-60-96-02-C (Dup of 60-96-01)*	Excellent	3.90	U	MS/MSD
4B	*PL2IM-2-60-42-02-C*	Good	9.70		
4B	*PL2IM-2-60-37-02-C*	Fair	22.80		
4C	*PL2IM-2-60-58-01-C*	Fair	0.71	U	
4C	*PL2IM-2-60-62-01-C*	Fair	0.71	U	
4C	*PL2IM-2-60-96-03-C*	Fair	0.72	U	
4C	*PL2IM-2-60-47-02-C*	Fair	1.98		
4C	*PL2IM-2-60-42-01-C*	Good	4.90		
4C	*PL2IM-2-60-45-05-C*	Fair	10.00		
4C	*PL2IM-2-60-43-02-C*	Poor to good, very tight joint along inside of building curb/wall	15.60		
5	PL2-JM-Z-138-3 (Dup of 138-2)	Poor, weathered/eroded, dirt infilled. Common distribution in area.	16.00	U	**16U PCB superseded by 9.6Y (PL2-JM-Z-138-4)
5	PL2-JM-X-220-1	Poor, weathered/eroded. Common distribution in area.	55.00	U	**55U PCB superseded by 9.9Y (PL2-JM-X-220-2)
5	PL2-JM-Z-138-2	Poor, weathered/eroded, dirt infilled. Common distribution in area.	80.00	U	**80U PCB superseded by 9.6Y (PL2-JM-Z-138-4)
5	PL2-JM-X-220-2 (Dup of 220-1)	Poor, weathered/eroded. Common distribution in area.	9.90	Y	
5	PL2-JM-Z-138-4 (Dup of 138-2 & 138-3)	Poor, weathered/eroded, dirt infilled. Common distribution in area.	9.60	Y	
6	PL2-JM-X-202-2	Poor, not exposed, underlies PL2-JM-X-202-1.	6.20		
6	PL2-JM-X-235-1	Poor, weathered/eroded; dirt, moss, & grass infilled. Very limited distribution in area.	6.30		
6	PL2-JM-X-202-1	Poor, weathered/eroded, dirt & gravel infilled. Very limited distribution in area.	10.00		
8A	PL2-JM-Z-154-3 (Dup of 154-1)	Fair, some weathering. Common distribution on sidewalk in area.	400.00	U	**400U PCB superseded by 7.8Y (PL2-JM-Z-154-4)
8A	PL2-JM-Z-154-4 (Dup of 154-1 & 154-3)	Fair, some weathering. Common distribution on sidewalk in area.	7.80	Y	
8A	PL2-JM-Z-154-1	Fair, some weathering. Common distribution on sidewalk in area.	560.00	U	**560U PCB superseded by 7.8Y (PL2-JM-Z-154-4)
8B	PL2-JM-Y-214-7	Poor, some weathering/erosion, dirt & moss infilled. Very limited distribution in area.	1.59	J	
8B	PL2-JM-Y-214-9	Poor, some weathering/erosion, dirt & moss infilled. Very limited distribution in area.	2.70		

Notes:
* Italicized sample number indicates sample collected during the summer 2008 Phase 2 investigation
** Shading indicates that the Reporting Limit was lowered and thereby superseded by analytical results for a duplicate sample. An extra cleaning step was used in the sample preparation of the duplicate sample to reduce chromatographic interference that caused the elevated Reporting Limits in the superseded results.

Table 2 - Plant 2 Caulk Sampling Summary - Sorted by Caulk Type and PCB Concentration

CAULK TYPE	COLOR	DESCRIPTION	PCB Concentration Category (ppm)	2-10 Area		2-40s Area		2-60s/2-66 Area		All Areas Combined	
				PCB Range (ppm)	No. of Samples	PCB Range (ppm)	No. of Samples	PCB Range (ppm)	No. of Samples	PCB Range (ppm)	No. of Samples
1A1	Dull black	Stiff - hard. Fresh surface black, glassy, rough, crumbly	> 1.0 & ≤ 25.0	0.73U - 24.8	41	0.79U - 10.3	10	0.79U - 18.6	25	0.73U - 24.8	76
1A2	Same as 1A1, but anomalous elevated PCB concentrations > 50 ppm, located on 2-62 Slab & near Bldg 2-64 & E side of Bldg 2-15		> 50.0	54 - 180	2	NA	0	66 - 39000	6	54 - 39000	8
1A3	Same as 1A1, but with concentrations >25 ppm & ≤ 50 ppm		> 25.0 & ≤ 50.0	25.5 - 44	4	NA	0	46 - 48	2	25.5 - 48	6
1B	Dull black	Stiff - hard, brittle. Fresh surface black, glassy, concoidal fracture.	> 1.0 & ≤ 25.0	0.79U - 7.2	8	0.79U - 5.0	6	2.5 - 8.1	4	0.79U - 8.1	18
1C1	Dull black	Type 1A, but includes metal shavings, small screws, etc. in caulk matrix	> 1.0 & ≤ 25.0	5.6 - 24.0	11	5.6 - 12.3	5	2.2 - 24.0	7	2.2 - 24.0	23
1C2	Dull black	Type 1A, but includes metal shavings, small screws, etc. in caulk matrix	> 25.0 & ≤ 50.0	29 - 42	4	NA	0	31.1 - 44	2	29 - 44	6
1D	Dull black	Same as Type 1A, but pliable to semi-pliable. Fresh surface black, glassy, rough	> 1.0 & ≤ 25.0	NA	0	8.3	1	NA	0	8.3	1
1E	Dull black	Soft - stiff, pliable - semi-piable. Fresh surface dull - semi glossy black, smooth - rough.	> 1.0 & ≤ 25.0	0.79U - 2.5	4	0.79U - 3.0	15	0.79U - 1.4	3	0.79U - 3.0	22
2A	Light gray	Soft - stiff, pliable, spongy - rubbery	> 1.0 & ≤ 25.0	0.8U - 2.0U	3	0.79U - 1.6Y	3	0.8U	3	0.8U - 2.0U	9
2B	Light gray	Strong, very stiff - very hard, brittle	≤ 1.0	0.8U	1	NA	0	NA	0	0.8U	1
2C	Dull gray	Stiff - hard, pliable	≤ 1.0*	NA	0	0.79U	1	29300 - 40500	2	0.79U - 40500	3
3	Brown to Black	Soft - firm, pliable & spongy	> 1.0 & ≤ 25.0	0.79U - 0.8U	2	NA	0	0.8U - 2.2	2	0.79U - 2.2	4
4A1	Dull, gray to brownish-black	Soft, friable, course fibrous, wood-like appearance	> 1.0 & ≤ 25.0	NA	0	NA	0	2.3 - 22.5	7	2.3 - 22.5	7
4A2	Same as 4A1, but with concentrations >25 ppm & ≤ 50 ppm		> 25.0 & ≤ 50.0	NA	0	NA	0	27 - 34000	4	27 - 34000	4
4B	Dull, brown to brownish-black	Soft to stiff, friable, fibrous. Fine to med light tan fibers. Peat moss-like apprearance	> 1.0 & ≤ 25.0	0.71U - 1.2U	6	NA	0	0.67U - 22.8	6	0.67U - 22.8	12
4C	Dull, brown to brownish-black	Friable, platy, stiff to semi-hard, brittle. Fine light tan fibers, slate-like appearance.	> 1.0 & ≤ 25.0	11.0	1	0.71U	1	0.71U - 15.6	7	0.71U - 15.6	9
5	Brown	Soft, pliable, spongy, stretchy, sticky	> 1.0 & ≤ 25.0	NA	0	NA	0	9.6Y - 9.9Y	5	9.6Y - 9.9Y	5
6	Reddish brown to black	Stiff, semi-pliable. Fresh surface smooth, yellow/brown/orange	> 1.0 & ≤ 25.0	NA	0	NA	0	6.2 - 10.0	3	6.2 - 10.0	3
7	Amber	Smooth, translucent, very hard, glassy	> 1.0 & ≤ 25.0	0.79U - 3.2	2	NA	0	NA	0	0.79U - 3.2	2
8A	White	Soft - stiff, pliable, spongy	> 1.0 & ≤ 25.0	NA	0	NA	0	7.8Y	3	7.8Y	3
8B	White	Firm - stiff, finely wrinkled, cracked. Fresh surface smooth, dull grayish-white	> 1.0 & ≤ 25.0	NA	0	NA	0	1.6 - 2.7	2	1.6 - 2.7	2
			Totals		89		42		93		224

* PCB Concentration Category assigned for mapping purposes in the *Phase 1 Report and Work Plan*

CAULK TYPE	SAMPLE NUMBER*	GENERAL CONDITION OF CAULK IN JOINT	PCBs (ppm)	Q	COMMENTS
1A1	*PL2IM-2-10-19-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.73	U	
1A1	*PL2IM-2-10-29-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.74	J	
1A1	*PL2IM-2-10-11-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.77	U	
1A1	*PL2IM-2-10-03-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.79	U	
1A1	PL2IM-2-10-05-05-C	Poor, weathered/eroded, dirt & moss infilled	0.79	U	
1A1	*PL2IM-2-10-13-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.79	U	
1A1	*PL2IM-2-10-33-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.79	U	
1A1	*PL2IM-2-10-51-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1" depth	0.79	U	
1A1	PL2IM-2-40-06-03-C	Poor, highly weathered/eroded, dirt & moss infilled	0.79	U	
1A1	*PL2IM-2-40-11-01-C*	Fair to good	0.79	U	
1A1	*PL2IM-2-60-05-01-C*	Poor, mostly weathered/eroded in area; infilled with dirt, moss & grass	0.79	U	
1A1	PL2-JM-Y-214-6	Poor, weathered/eroded, some dirt & moss infilling. Limited distribution in area.	0.79	U	
1A1	*PL2IM-2-10-37-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.80	U	
1A1	PL2-JM-X-215-3	Removed	0.80	U	Removed during recent construction activities
1A1	PL2IM-2-40-08-01-C	Poor, highly weathered/eroded, dirt & moss infilled	0.92		
1A1	*PL2IM-2-10-09-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	0.97		
1A1	PL2IM-2-40-06-02-C	Fair, some weathering/erosion, dirt & moss infilled	0.99		
1A1	*PL2IM-2-10-73-03-C (Dup of 10-73-02)*	Good at sampling location around column, but weathered/eroded elsewhere	1.10		
1A1	*PL2IM-2-10-73-02-C*	Good at sampling location around column, but weathered/eroded elsewhere	1.20		
1A1	*PL2IM-2-40-25-01-C*	Poor, mostly weathered/eroded at surface; dirt, moss & grass infilled	1.40		
1A1	*PL2IM-2-60-03-01-C*	Poor, mostly weathered/eroded in area; infilled with dirt, moss & weeds	1.4		
1A1	PL2-JM-Z-207-2	Poor, weathered/eroded. Common distribution in area.	1.70		Located on 2-62 Slab
1A1	PL2-JM-X-215-2	Removed	1.81	J	Removed during recent construction activities
1A1	*PL2IM-2-10-19-02-C (Dup of 10-19-01)*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	2.10		
1A1	*PL2IM-2-10-61-01-C*	Fair, squeezing out of foundation joint around building	2.60		
1A1	*PL2IM-2-40-31-01-C*	Poor, mostly weathered/eroded from joints in sampling area; dirt infilled	2.60		
1A1	*PL2IM-2-10-53-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	2.77		
1A1	*PL2IM-2-40-15-04-C*	Poor, mostly weathered/eroded at surface; dirt & grass infilled	2.80		
1A1	PL2IM-2-10-20-02-C	Poor, weathered/eroded in most areas	3.30		
1A1	*PL2IM-2-10-07-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	3.40		
1A1	*PL2IM-2-10-79-01-C*	Good, squeezing out of foundation joint around building	3.44		
1A1	*PL2IM-2-10-17-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	3.60		
1A1	*PL2IM-2-10-23-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	3.60		
1A1	*PL2IM-2-10-59-02-C*	Fair to poor	3.70		
1A1	*PL2IM-2-60-73-02-C*	Fair to poor, weathering & some erosion	3.90		
1A1	PL2-JM-Y-226-1	Fair, moderately weathered/eroded, dirt & moss infilled. Limited distribution in area.	4.00		
1A1	*PL2IM-2-60-49-01-C*	Fair to poor, weathered and eroding	4.02		

Table 2 - Plant 2 Caulk Sampling Summary - Sorted by Caulk Type and PCB Concentration

CAULK TYPE	SAMPLE NUMBER*	GENERAL CONDITION OF CAULK IN JOINT	PCBs (ppm)	Q	COMMENTS
1A1	PL2-JM-Z-207A-1	Poor, weathered/eroded, dirt & moss infilled. Common distribution in area.	4.10		Located on 2-62 Slab
1A1	*PL2IM-2-10-17-02-C (Dup of 10-17-01)*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	4.20		MS/MSD
1A1	*PL2IM-2-60-21-01-C*	Poor, mostly weathered/eroded from joints in sampling area	4.50		
1A1	PL2IM-2-10-20-01-C	Fair, weathered/eroded in some areas	4.60		
1A1	PL2-JM-Z-207A-2 (Dup of 207A-1)	Poor, weathered/eroded, dirt & moss infilled. Common distribution in area.	5.10		Located on 2-62 Slab
1A1	*PL2IM-2-10-63-01-C*	Fair, partially weathered, moss and dirt infilled	5.40		
1A1	*PL2IM-2-60-19-02-C (Dup of 60-19-01)*	Fair	5.40		MS/MSD
1A1	PL2IM-2-10-20-01A-C (Dup of 10-20-01)	Fair, weathered/eroded in some areas	5.60		
1A1	PL2-JM-Z-207A-3	Poor, weathered/eroded. Common distribution in area.	5.60		Located on 2-62 Slab
1A1	*PL2IM-2-10-57-01-C*	Fair	6.30		
1A1	*PL2IM-2-10-35-01-C*	Poor, most joints in area severely weathered & almost completely eroded	6.50		
1A1	*PL2IM-2-60-01-01-C*	Good at sample location, but poor elasewhere in the area	7.10		
1A1	*PL2IM-2-60-19-01-C*	Fair	7.30		
1A1	PL2IM-2-40-01-02-C	Fair, some weathering/erosion	7.50		
1A1	*PL2IM-2-40-17-01-C*	Poor, mostly weathered/eroded at surface; dirt & grass infilled	7.50		
1A1	*PL2IM-2-60-09-02-C*	Fair, squeezing out of foundation joint around building	7.50		
1A1	PL2IM-2-10-44-03-C	Poor, some caulk missing from joint	7.60		
1A1	*PL2IM-2-10-01-02-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	8.00		
1A1	*PL2IM-2-60-11-02-C*	Fair to poor, generally weathered out of foundation joint; infilled with dirt & moss	8.10		
1A1	*PL2IM-2-10-41-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	8.40		
1A1	PL2IM-2-10-60-03-C	Fair, cracking	8.50		
1A1	*PL2IM-2-10-41-02-C (Dup of 10-41-01)*	Poor, partially to mostly weathered/eroded from most joints in sampling area	9.90		MS/MSD
1A1	*PL2IM-2-10-45-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	9.90		
1A1	PL2IM-2-40-16-02-C	Poor, caulk only half fills joint, weathered/eroded; dirt, moss & grass infilled	10.30		
1A1	PL2-JM-Z-207-1	Poor, eroded & cracked, dirt & moss infilled. Common distribution in area.	10.30		Located on 2-62 Slab
1A1	*PL2IM-2-10-15-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	10.60		
1A1	*PL2IM-2-10-21-01-C*	Poor, mostly weathered/eroded at surface, better condition at 1/2" depth	10.90		
1A1	PL2IM-2-10-05-03-C	Poor, weathered/eroded, dirt & moss infilled	11.30		
1A1	PL2IM-2-10-60-02A-C (Dup of 10-60-02)	Poor, weathered/eroded in many areas	11.90		
1A1	PL2IM-2-10-60-02-C	Poor, weathered/eroded in many areas	12.40		
1A1	*PL2IM-2-60-81-01-C*	Fair to poor, weathering & starting to erode from joint	12.50		
1A1	PL2-JM-Y-214-8	Poor, weathered/eroded, dirt & moss infilled. Limited distribution in area.	12.90		
1A1	*PL2IM-2-60-07-01-C*	Fair to poor, mostly weathered/eroded from joints in area; infilled with dirt & moss	13.00		
1A1	PL2-JM-X-215-7	Good, minor weathering. Common distribution in area.	13.00		
1A1	*PL2IM-2-60-23-01-C*	Fair, squeezing out of foundation joint around building	14.20		
1A1	PL2IM-2-10-05-02-C	Poor, partially weathered/eroded, dirt & moss infilled	14.50		
1A1	*PL2IM-2-10-31-01-C*	Poor, most joints in area severely weathered & almost completely eroded	17.80		
1A1	*PL2IM-2-60-35-01-C*	Fair	18.60		
1A1	*PL2IM-2-10-27-01-C*	Poor, mostly weathered/eroded in most areas	24.80		
1A2	*PL2IM-2-10-49-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	54.00		
1A2	*PL2IM-2-60-37-01-C*	Fair	66.00		
1A2	PL2-JM-Z-212-3 (Dup of 212-2)	Poor, weathered/eroded; dirt, moss & grass infilled. Common distribution in area	68.00		Located on 2-62 Slab
1A2	PL2-JM-Z-212-2	Poor, weathered/eroded; dirt, moss & grass infilled. Common distribution in area	110.00		Located on 2-62 Slab
1A2	*PL2IM-2-10-39-01-C*	Poor, partially to mostly weathered/eroded from most joints in sampling area	180.00		
1A2	PL2-JM-X-215-1	Removed	740.00		Removed from 2-64 during recent construction activities
1A2	PL2-JM-Y-204-1	Fair, weathered, dirt & moss infilling. Common distribution in area.	29000.00		Located on 2-62 Slab
1A2	PL2-JM-Z-735-1	Poor, weathered/eroded, dirt, moss & grass infilled. Limited distribution in area.	39000.00		Located on 2-62 Slab
1A3	*PL2IM-2-10-39-03-C*	Poor, mostly weathered/eroded from joints, very little caulk in joints	25.50		
1A3	*PL2IM-2-10-39-05-C*	Poor, mostly weathered/eroded from joints in area	29.00		
1A3	*PL2IM-2-10-39-04-C*	Fair to poor, fair in this joint, but poor in surrounding joints, weathered/eroded	41.00		
1A3	*PL2IM-2-10-40-04-C*	Fair to poor, weathered/eroded at surface, better condition at 1/2" depth	44.00		
1A3	PL2-JM-Z-210-1	Poor, eroded & cracked, dirt & moss infilled. Common distribution in area.	45.80	J	Located on 2-62 Slab, reclassified to 1A2 from 1A3
1A3	*PL2IM-2-60-45-01-C*	Good	48.00		
1B	PL2IM-2-10-55-03-C	Fair, partially weathered/eroded, dirt & moss infilled	0.79	U	
1B	PL2IM-2-40-24-02-C	Good	0.79	U	
1B	PL2IM-2-10-32-01-C	Fair, some weathering/erosion	0.80	U	
1B	PL2IM-2-10-32-02-C	Fair, partially eroded in most areas	0.80	U	
1B	PL2IM-2-10-40-02-C	Poor, weathered/eroded in most areas, dirt & moss infilled.	0.80	U	
1B	PL2IM-2-10-40-03-C	Poor, weathered/eroded in most areas, dirt & moss infilled.	0.80	U	
1B	PL2IM-2-40-15-02-C	Poor, mostly weathered/eroded, dirt & moss infilled	0.80	U	
1B	PL2IM-2-40-24-03-C	Poor, weathered/eroded in many areas	0.80	U	
1B	PL2IM-2-40-24-04-C (Dup of 40-24-03)	Poor, weathered/eroded in many areas	0.80	U	
1B	PL2-JM-X-233-1	Poor - Fair, weathered/eroded, dirt infilled. Common distribution in area.	2.50		
1B	PL2-JM-Y-214-1	Poor - Fair, some weathering/erosion, dirt & moss infilled. Common distribution in area.	2.50		
1B	PL2-JM-Y-214-2	Removed	2.70		Removed during recent construction activities

Table 2 - Plant 2 Caulk Sampling Summary - Sorted by Caulk Type and PCB Concentration

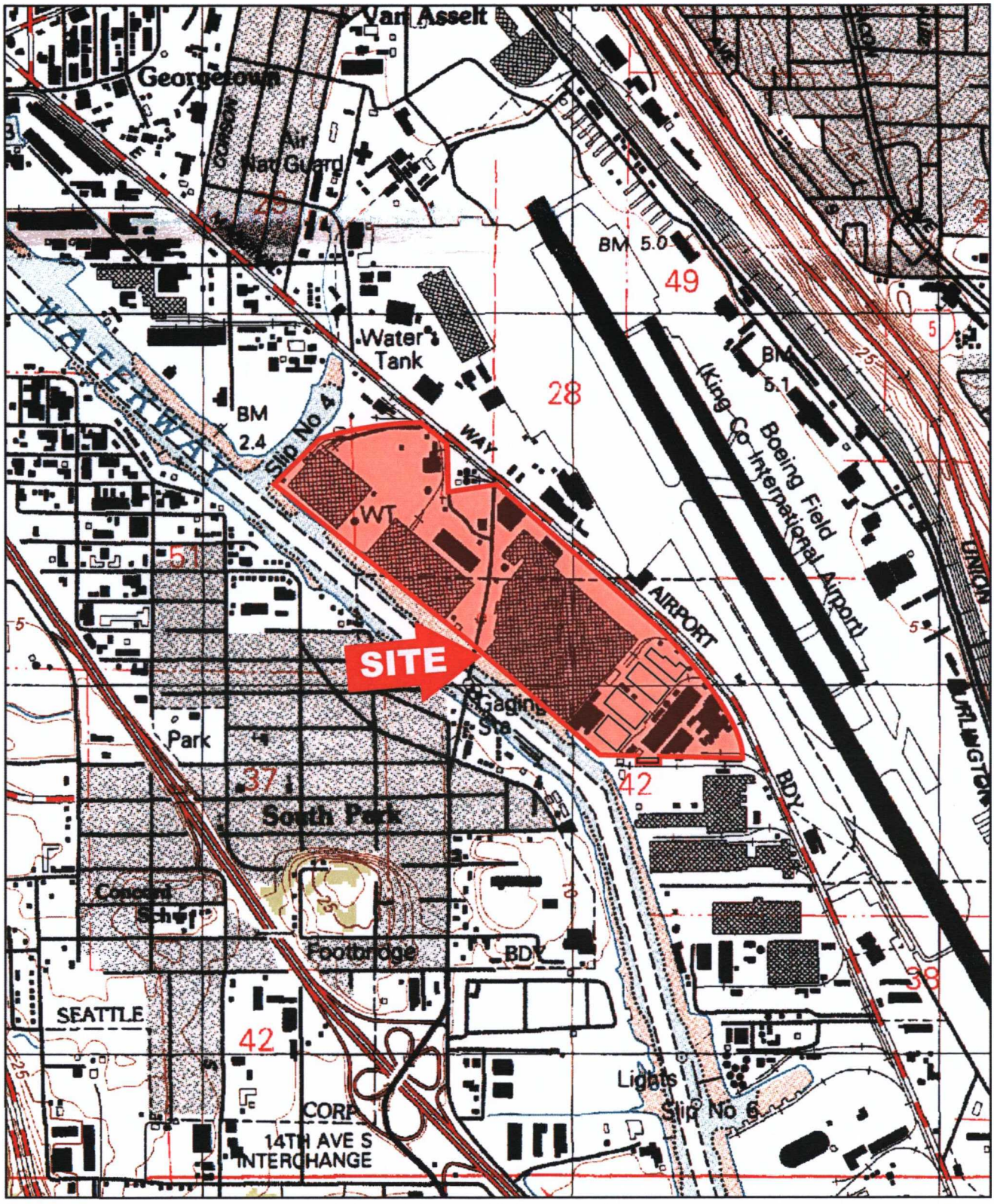
CAULK TYPE	SAMPLE NUMBER*	GENERAL CONDITION OF CAULK IN JOINT	PCBs (ppm)	Q	COMMENTS
1B	PL2IM-2-40-18-01-C	Poor, weathered/eroded in many areas; dirt, moss & grass infilled	3.10		
1B	PL2IM-2-10-75-01-C	Fair, some cracking & weathering/erosion	3.80		
1B	PL2IM-2-10-75-02-C (Dup of 10-75-01)	Fair, some cracking & weathering/erosion	4.80		
1B	PL2IM-2-40-09-01-C	Fair to poor, weathered/eroded in some areas	5.00		
1B	PL2IM-2-10-44-02-C	Poor, weathered/eroded in most areas; dirt, moss & grass infilled.	7.20		
1B	PL2-JM-X-215-4	Fair, some weathering/erosion, dirt & moss infilled. Limited distribution in area.	8.10		
1C1	*PL2IM-2-60-87-01-C*	Good	2.17		
1C1	*PL2IM-2-60-09-01-C*	Good	2.40		
1C1	*PL2IM-2-60-73-01-C*	Fair	2.57		
1C1	*PL2IM-2-60-19-03-C*	Fair	5.30		
1C1	*PL2IM-2-10-73-01-C*	Good at sample location, but partially weathered/eroded elsewhere in area	5.55		
1C1	*PL2IM-2-40-21-01-C*	Fair, some weathering/erosion; partially infilled with dirt & grass	5.60		
1C1	*PL2IM-2-60-15-01-C*	Fair, partially to mostly covered by mortar & Type 7 caulk	5.70		
1C1	*PL2IM-2-10-29-02-C*	Fair, partially weathered/eroded	7.50		
1C1	PL2IM-2-40-18-02-C	Good to fair	7.80		
1C1	PL2IM-2-40-19-03-C	Fair to good, slightly weathered/eroded	9.20		
1C1	*PL2IM-2-40-23-01-C*	Poor, mostly weathered/eroded; infilled with dirt & grass	12.00		
1C1	PL2IM-2-40-19-03A-C (Dup of 40-19-03)	Fair to good, slightly weathered/eroded	12.30		
1C1	*PL2IM-2-10-59-04-C (Dup of 10-59-03)*	Fair, only partially weathered/eroded	12.40		MS/MSD
1C1	*PL2IM-2-10-59-05-C*	Fair to poor, partially weathered/eroded from joint	14.20		
1C1	*PL2IM-2-10-72-02-C*	Fair, minor weathering/erosion	16.80		
1C1	*PL2IM-2-10-59-01-C*	Fair to poor, significantly weathered/eroded in some areas	16.90		
1C1	*PL2IM-2-10-59-03-C*	Fair, only partially weathered/eroded	17.30		
1C1	*PL2IM-2-60-53-01-C*	Fair to good	18.60		
1C1	*PL2IM-2-10-71-01-C*	Fair, partially weathered	18.80		
1C1	*PL2IM-2-10-64-01-C*	Fair to poor, partially weathered/eroded from joint	23.00		
1C1	*PL2IM-2-10-77-01-C*	Fair to good, some cracking, weathering & erosion	23.00		
1C1	*PL2IM-2-10-72-03-C*	Fair, only partially weathered/eroded	24.00		
1C1	*PL2IM-2-60-47-01-C*	Fair	24.00		
1C2	PL2IM-2-10-75-04-C	Fair to poor, weathered/eroded in many areas	29.00		
1C2	*PL2IM-2-60-45-02-C*	Fair to good	31.10		
1C2	PL2IM-2-10-75-03-C	Good	36.10		
1C2	PL2IM-2-10-65-02-C	Poor, weathered/eroded in many areas, dirt & rock infilled	40.00		
1C2	*PL2IM-2-10-72-01-C*	Fair to poor, weathered/partially eroded in some areas	42.00		
1C2	*PL2IM-2-60-11-01-C*	Fair	44.00		
1D	PL2IM-2-40-16-01-C	Fair, some areas weathered/eroded	8.30		
1E	PL2IM-2-10-80-01-C	Excellent	0.79	U	
1E	PL2IM-2-40-06-01-C	Good to fair, some dirt & moss infilling	0.79	U	
1E	PL2IM-2-40-08-02-C	Good, only slightly weathered	0.79	U	
1E	PL2IM-2-40-09-02-C	Good	0.79	U	
1E	PL2IM-2-40-10-03-C	Good	0.79	U	
1E	PL2-JM-Z-212-4 (Dup of 212-1)	Fair, cracked/segmented. Common distribution on area roads.	0.79	U	
1E	PL2IM-2-10-55-04-C	Fair, little to no weathering/erosion	0.80	U	
1E	PL2IM-2-40-08-03-C (Dup of 40-08-02)	Good, only slightly weathered	0.80	U	
1E	PL2IM-2-40-19-02A-C (Dup of 40-19-02)	Good	0.80	U	
1E	PL2IM-2-40-15-01-C	Good	0.82		
1E	PL2IM-2-40-15-03-C	Good, slightly weathered	0.88		
1E	PL2IM-2-40-09-03-C	Good	0.89		
1E	PL2IM-2-40-10-04-C	Good	0.95		
1E	PL2IM-2-10-80-02-C	Excellent	1.10		
1E	PL2IM-2-40-19-02-C	Good	1.10		
1E	PL2-JM-Z-212-1	Fair, cracked/segmented. Common distribution on area roads.	1.20	U	
1E	PL2IM-2-40-09-05-C (Dup of 40-09-04)	Good	1.30		
1E	PL2IM-2-40-09-04-C	Good	1.40		
1E	PL2-JM-Z-154-2	Poor - Fair, cracked/segmented. Common distribution on area roads.	1.40		
1E	PL2IM-2-40-10-01-C	Fair	1.50		
1E	PL2IM-2-10-65-01-C	Good	2.50		
1E	PL2IM-2-40-10-02-C	Fair, weathered	3.00		
2A	PL2IM-2-40-01-03-C	Good	0.79	U	
2A	PL2IM-2-40-01-04-C	Fair, rubbery, easily pulled from joint	0.79	U	
2A	PL2IM-2-10-05-04-C	Excellent	0.80	U	
2A	PL2-JM-V-189-1	Good. Common distribution in area.	0.80	U	
2A	PL2-JM-Z-213-1	Good. Common distribution in area.	0.80	U	
2A	PL2-JM-Z-706-1	Good. Common distribution in area.	0.80	U	
2A	PL2IM-2-40-01-05-C	Fair, rubbery, easily pulled from joint	1.60	Y	

Table 2 - Plant 2 Caulk Sampling Summary - Sorted by Caulk Type and PCB Concentration

CAULK TYPE	SAMPLE NUMBER*	GENERAL CONDITION OF CAULK IN JOINT	PCBs (ppm)	Q	COMMENTS
2A	PL2IM-2-10-20-03-C	Excellent	1.90	U	
2A	PL2IM-2-10-20-04-C (Dup of 10-20-03)	Excellent	2.00	U	
2B	PL2IM-2-10-44-01-C	Fair, cracked & broken-out in some areas.	0.80	U	
2C	PL2IM-2-40-01-01-C	Good, slightly weathered	0.79	U	
2C	PL2-JM-Y-214-3	Removed	29300.00	J	Voluntarily removed by Boeing
2C	PL2-JM-Y-214-4	Removed	40500.00	J	Voluntarily removed by Boeing
3	PL2IM-2-10-55-02-C	Good	0.79	U	
3	PL2IM-2-10-55-01-C	Good	0.80	U	
3	PL2-JM-V-188-1	Fair - Good, moss covered. Limited distribution in area.	0.80	U	
3	PL2-JM-Z-138-1	Good. Common distribution in area.	2.20	J	
4A1	*PL2IM-2-60-07-02-C*	Fair to good	2.30		
4A1	PL2-JM-X-215-6	Fair, little weathering/erosion, dirt infilled. Common distribution in area.	5.20		
4A1	*PL2IM-2-60-39-01-C*	Fair to good.	5.60		
4A1	PL2-JM-Y-214-5	Fair, some weathering/erosion, dirt infilled. Common distribution in area.	8.60		
4A1	PL2-JM-X-215-5	Removed	13.90		Removed during recent construction activities
4A1	PL2-JM-Y-225-1	Poor, highly weathered/eroded; dirt & moss infilled. Limited-common distribution.	13.90		
4A1	*PL2IM-2-60-37-03-C*	Good	22.50		
4A2	PL2-JM-X-233-2	Fair, moderately weathered/eroded. Common distribution in area.	27.00		
4A2	*PL2IM-2-60-43-01-C*	Fair to good.	27.60		
4A2	*PL2IM-2-60-45-03-C*	Fair to good	29.00		
4A2	PL2-JM-Y-214-10	Removed	34000.00		Voluntarily removed by Boeing
4B	*PL2IM-2-60-96-01-C*	Excellent	0.67	U	
4B	*PL2IM-2-10-75-05-C*	Fair to good	0.71	U	
4B	*PL2IM-2-10-44-04-C*	Good	0.72	U	
4B	*PL2IM-2-10-55-05-C*	Fair	0.79	U	
4B	*PL2IM-2-60-21-03-C*	Fair to good.	0.88		
4B	*PL2IM-2-10-75-06-C (Dup of 10-75-05)*	Fair to good	0.90	U	MS/MSD
4B	*PL2IM-2-10-65-04-C (revised)*	Fair	0.98		Sample No. 'revised from PL2IM-2-10-65-03
4B	*PL2IM-2-10-20-05-C*	Excellent	1.20	U	
4B	*PL2IM-2-60-45-04-C*	Good	3.30		
4B	*PL2IM-2-60-96-02-C (Dup of 60-96-01)*	Excellent	3.90	U	MS/MSD
4B	*PL2IM-2-60-42-02-C*	Good	9.70		
4B	*PL2IM-2-60-37-02-C*	Fair	22.80		
4C	*PL2IM-2-40-31-02-C*	Fair	0.71	U	Sample No. revised from PL2IM-2-40-31-01-C
4C	*PL2IM-2-60-58-01-C*	Fair	0.71	U	
4C	*PL2IM-2-60-62-01-C*	Fair	0.71	U	
4C	*PL2IM-2-60-96-03-C*	Fair	0.72	U	
4C	*PL2IM-2-60-47-02-C*	Fair	1.98		
4C	*PL2IM-2-60-42-01-C*	Good	4.90		
4C	*PL2IM-2-60-45-05-C*	Fair	10.00		
4C	*PL2IM-2-10-44-05-C*	Fair	11.00		
4C	*PL2IM-2-60-43-02-C*	Poor to good, very tight joint along inside of building curb/wall	15.60		
5	PL2-JM-Z-138-4 (Dup of 138-2 & 138-3)	Poor, weathered/eroded, dirt infilled. Common distribution in area.	9.60	Y	
5	PL2-JM-X-220-2 (Dup of 220-1)	Poor, weathered/eroded. Common distribution in area.	9.90	Y	
5	PL2-JM-Z-138-3 (Dup of 138-2)	Poor, weathered/eroded, dirt infilled. Common distribution in area.	16.00	U	**16U PCB superseded by 9.6Y (PL2-JM-Z-138-4)
5	PL2-JM-X-220-1	Poor, weathered/eroded. Common distribution in area.	55.00	U	**55U PCB superseded by 9.9Y (PL2-JM-X-220-2)
5	PL2-JM-Z-138-2	Poor, weathered/eroded, dirt infilled. Common distribution in area.	80.00	U	**80U PCB superseded by 9.6Y (PL2-JM-Z-138-4)
6	PL2-JM-X-202-2	Poor, not exposed, underlies PL2-JM-X-202-1.	6.20		
6	PL2-JM-X-235-1	Poor, weathered/eroded; dirt, moss, & grass infilled. Very limited distribution in area.	6.30		
6	PL2-JM-X-202-1	Poor, weathered/eroded, dirt & gravel infilled. Very limited distribution in area.	10.00		
7	PL2IM-2-10-65-03-C	Fair, cracked, used in spot treatments only, very limited distribution	0.79	U	
7	PL2IM-2-10-60-01-C	Fair, cracked, used in spot treatments only, very limited distribution	3.20		
8A	PL2-JM-Z-154-4 (Dup of 154-1 & 154-3)	Fair, some weathering. Common distribution on sidewalk in area.	7.80	Y	
8A	PL2-JM-Z-154-3 (Dup of 154-1)	Fair, some weathering. Common distribution on sidewalk in area.	400.00	U	**400U PCB superseded by 7.8Y (PL2-JM-Z-154-4)
8A	PL2-JM-Z-154-1	Fair, some weathering. Common distribution on sidewalk in area.	560.00	U	**560U PCB superseded by 7.8Y (PL2-JM-Z-154-4)
8B	PL2-JM-Y-214-7	Poor, some weathering/erosion, dirt & moss infilled. Very limited distribution in area.	1.59	J	
8B	PL2-JM-Y-214-9	Poor, some weathering/erosion, dirt & moss infilled. Very limited distribution in area.	2.70		

Notes:
* Italicized sample number indicates sample collected during the summer 2008 Phase 2 investigation
** Shading indicates that the Reporting Limit was lowered and thereby superseded by analytical results for a duplicate sample. An extra cleaning step was used in the sample preparation of the duplicate sample to reduce chromatographic interference that caused the elevated Reporting Limits in the superseded results.

FIGURES



Golder Associates	Characterization of Caulk In Concrete Phase 2 IM Work Plan Boeing Plant 2 Seattle/Tukwila, Washington	Figure 1 Vicinity Map

SHEET	DRAWN BY	REVIEWED BY	DATE
1 of 1	JDD	SAM	10/13/08

DRAWING NO. 013164001600fg09.fh11

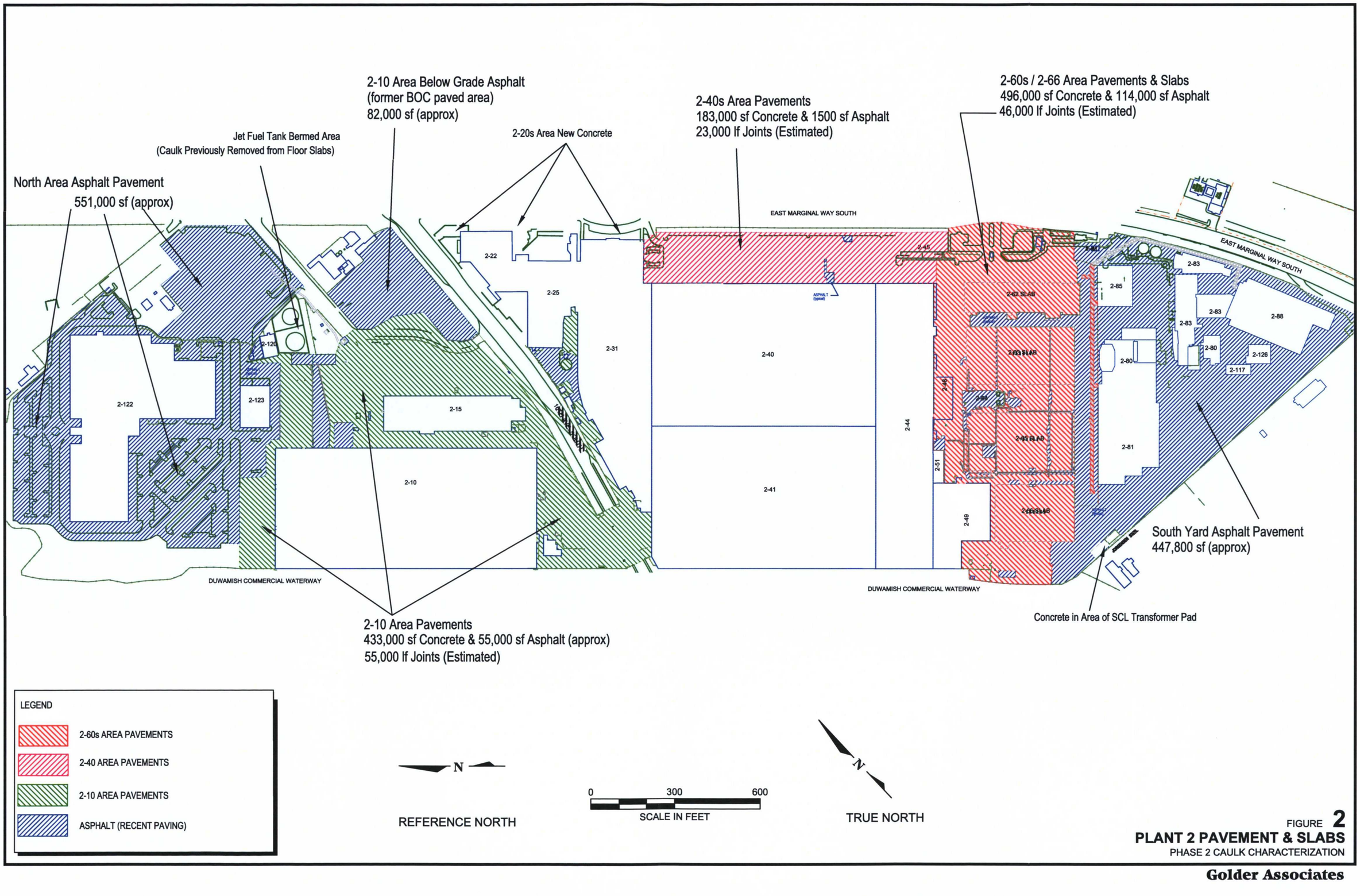
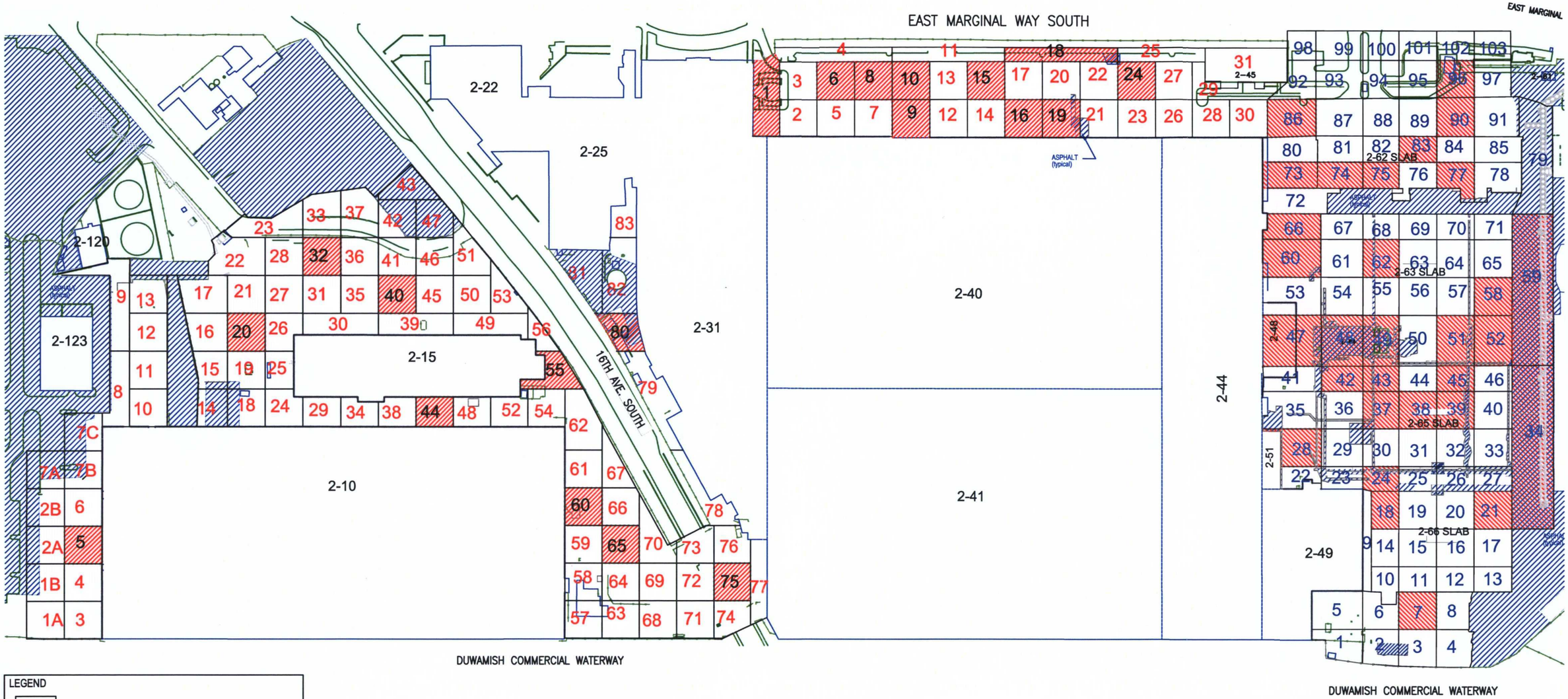


FIGURE **2**

PLANT 2 PAVEMENT & SLABS

PHASE 2 CAULK CHARACTERIZATION

Golder Associates



LEGEND

14	2-10 or 2-40 AREA SAMPLING BLOCK NUMBER
20	2-10 OR 2-40s AREA BLOCK RANDOMLY SELECTED AND THEN SAMPLED FOR CAULK DURING PHASE 1
20	2-60s AREA SAMPLING BLOCK NUMBER
7	2-60s AREA BLOCK ORIGINALLY SAMPLED DURING 2006/2006 INVESTIGATION

N

REFERENCE NORTH

0 200 400

SCALE IN FEET

N

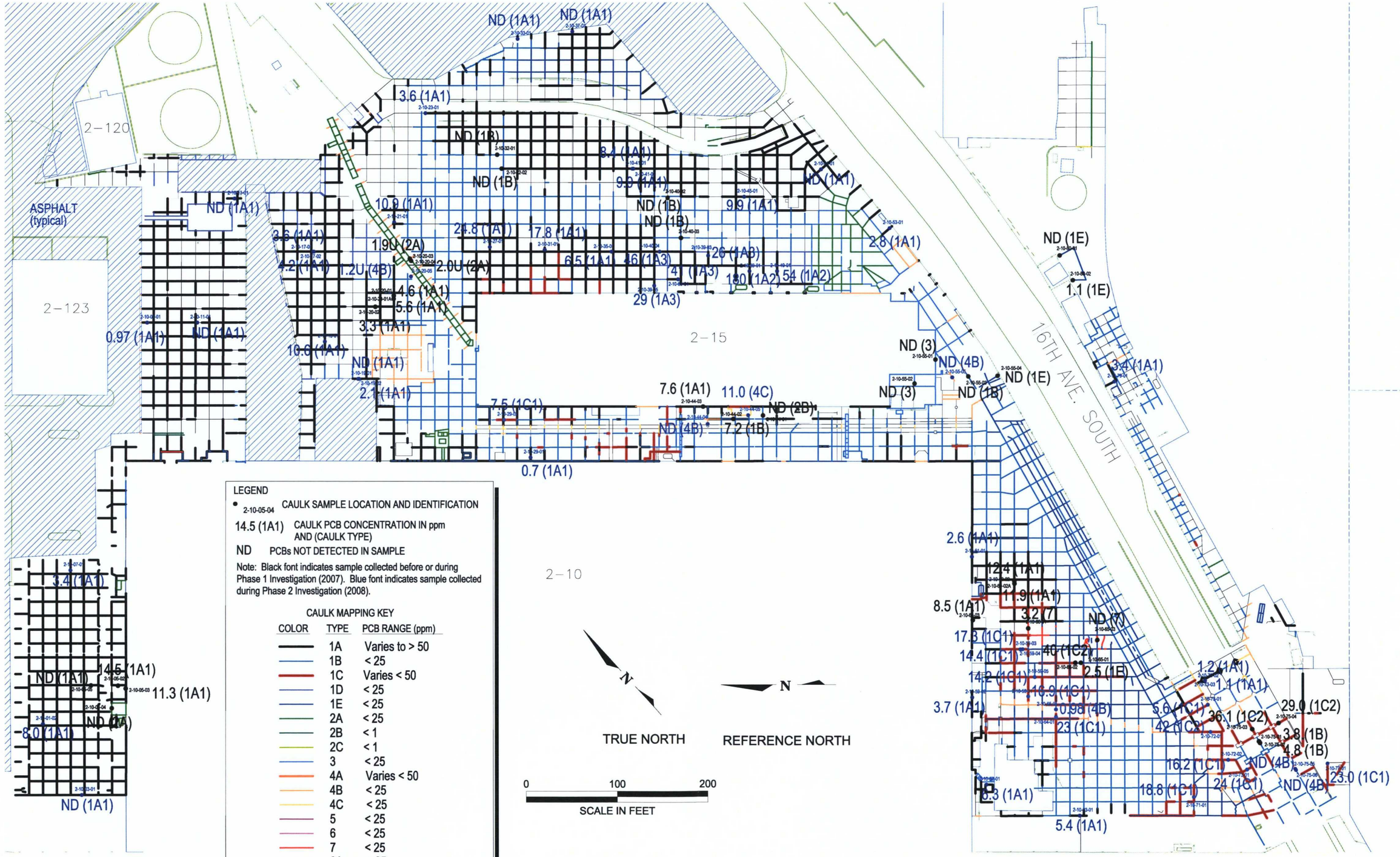
TRUE NORTH

FIGURE **3**

2-10, 2-40s, & 2-60s AREA SAMPLING BLOCKS

PHASE 2 CAULK CHARACTERIZATION

Golder Associates



LEGEND

- 2-10-05-04 CAULK SAMPLE LOCATION AND IDENTIFICATION
- 14.5 (1A1) CAULK PCB CONCENTRATION IN ppm AND (CAULK TYPE)
- ND PCBs NOT DETECTED IN SAMPLE

Note: Black font indicates sample collected before or during Phase 1 Investigation (2007). Blue font indicates sample collected during Phase 2 Investigation (2008).

CAULK MAPPING KEY

COLOR	TYPE	PCB RANGE (ppm)
	1A	Varies to > 50
	1B	< 25
	1C	Varies < 50
	1D	< 25
	1E	< 25
	2A	< 25
	2B	< 1
	2C	< 1
	3	< 25
	4A	Varies < 50
	4B	< 25
	4C	< 25
	5	< 25
	6	< 25
	7	< 25
	8A	< 25
	8B	< 25
	No caulk observed in joint	

FIGURE **4**

2-10 AREA: ALL CAULK TYPES, SAMPLE LOCATIONS AND RESULTS

PHASE 2 CAULK CHARACTERIZATION

Golder Associates

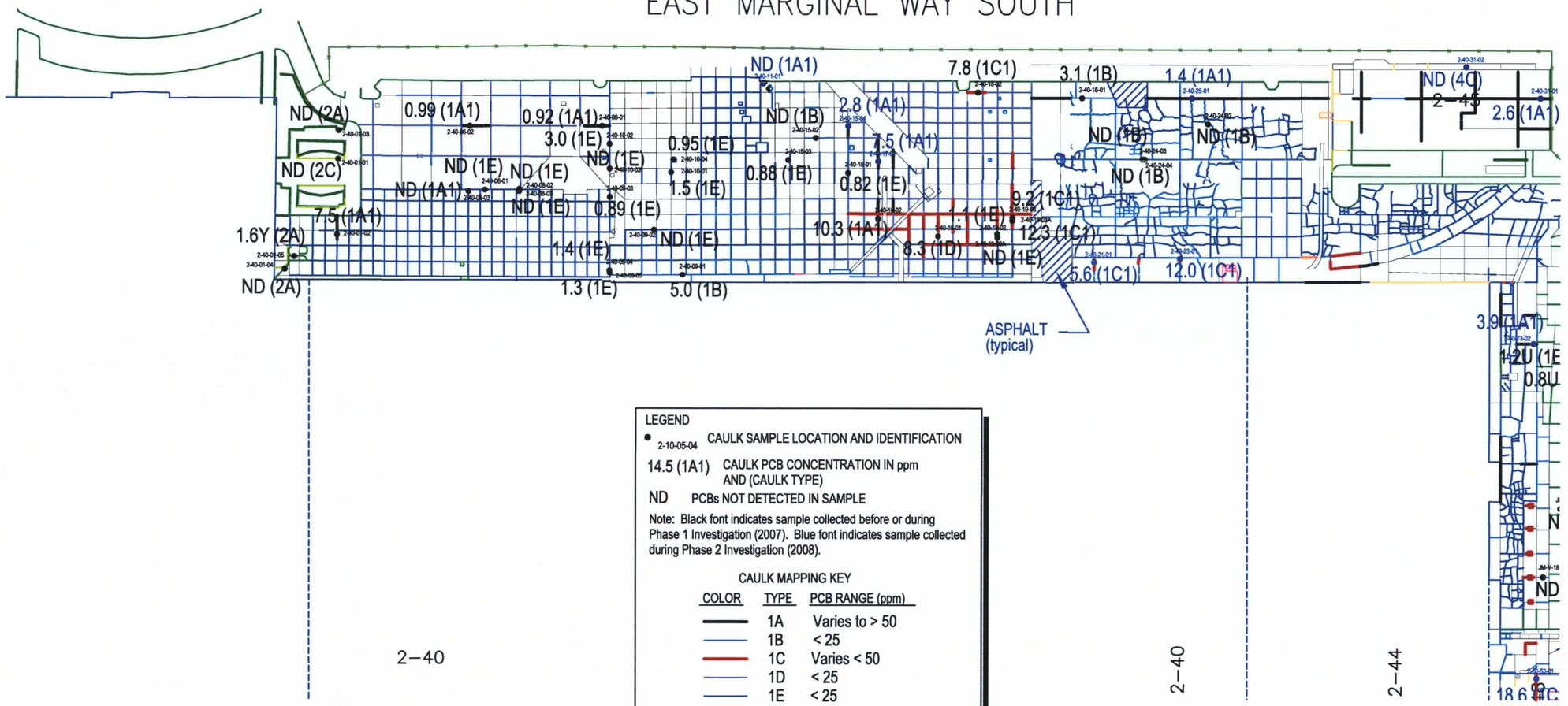


FIGURE **5**

2-40s AREA: ALL CAULK TYPES, SAMPLE LOCATIONS AND RESULTS

PHASE 2 CAULK CHARACTERIZATION

Golder Associates

EAST MARGINAL WAY SOUTH

ND (4C)
2.6 (1A1)
2-61
ND (4B)
560U (8A)
ND (4B)
400U (8A)
7.8Y (8A)
ND (4C)
1.4 (1E)
2.2 (1C1)
ND (2A)
2-85
12.5 (1A1)
5.6 (1A1)
39,000 (1A2)
3.9 (1A1)
2.6 (1C1)
2-62 SLAB
110.0 (1A2)
10.3 (1A1)
29,000 (1A2)
1.2U (1E)
0.8U (1E)
68.0 (1A2)
45.8 (1A2)
1.7 (1A1)
4.1 (1A1)
5.1 (1A1)
ASPHALT (typical)
ND (4C)
ND (2A)
55U (5)
2-63 SLAB
ND (3)
9.9Y (5)
9.6Y (5)
80U (5)
16U (5)
ND (4C)
2-80
2-44
18.6 (1C1)
4.02 (1A1)
1.6 (8B)
2.7 (8B)
10.0 (6)
2.2 (3)
2.0 (4C)
6.2 (6)
ND (1A1)
12.9 (1A1)
2.5 (1B)
2.7 (1B-R)
13.9 (4A1-R)
1.8 (1A1-R)
740 (1A2-R)
10.0 (4C)
ND (1A1-R)
8.1 (1B)
3.3 (4B)
29.0 (4A2)
24.0 (1C1)
4.9 (4C)
15.6 (4C)
18.0 (1A3)
13.0 (1A1)
29,300 (2C-R)
9.7 (4B)
5.1 (1C2)
5.2 (4A1)
27.6 (4A2)
34,000 (4A2-R)
66.0 (1A2)
8.6 (4A1)
40,500 (2C-R)
18.6 (1A1)
22.8 (4B)
22.5 (4A1)
2-65 SLAB
5.6 (4A1)
2-81
2-51
6.3 (6)
2.5 (1B)
7.3 (1A1)
5.4 (1A1)
4.9 (1A1)
ND (2A)
14.2 (1A1)
5.3 (1C1)
13.9 (4A1)
27.0 (4A2)
0.9 (4B)
2-66 SLAB
2-44
2-49
2.4 (1B1)
5.7 (1C1)
8.1 (1A1)
7.5 (1A1)
44.0 (1C2)
ND (1A1)
4.0 (1A1)
13.0 (1A1)
2.1 (1A1)
2.3 (4A1)
1.4 (1A1)
JORGENSEN STEEL
DUWAMISH COMMERCIAL WATERWAY

LEGEND

- 2-10-05-04 CAULK SAMPLE LOCATION AND IDENTIFICATION
- 14.5 (1A1) CAULK PCB CONCENTRATION IN ppm AND (CAULK TYPE)
- 40,500 (2C-R) SUFFIX "R" INDICATES CAULK REMOVED
- ND PCBs NOT DETECTED IN SAMPLE

Note: Black font indicates sample collected before or during Phase 1 Investigation (2007). Blue font indicates sample collected during Phase 2 Investigation (2008).

CAULK MAPPING KEY

COLOR	TYPE	PCB RANGE (ppm)
	1A	Varies to > 50
	1B	< 25
	1C	Varies < 50
	1D	< 25
	1E	< 25
	2A	< 25
	2B	< 1
	2C	< 1
	3	< 25
	4A	Varies < 50
	4B	< 25
	4C	< 25
	5	< 25
	6	< 25
	7	< 25
	8A	< 25
	8B	< 25
		No caulk observed in joint

0 100 200
SCALE IN FEET

TRUE NORTH N REFERENCE NORTH

FIGURE 6

2-60s AREA: ALL CAULK TYPES, SAMPLE LOCATIONS AND RESULTS

PHASE 2 CAULK CHARACTERIZATION

Golder Associates

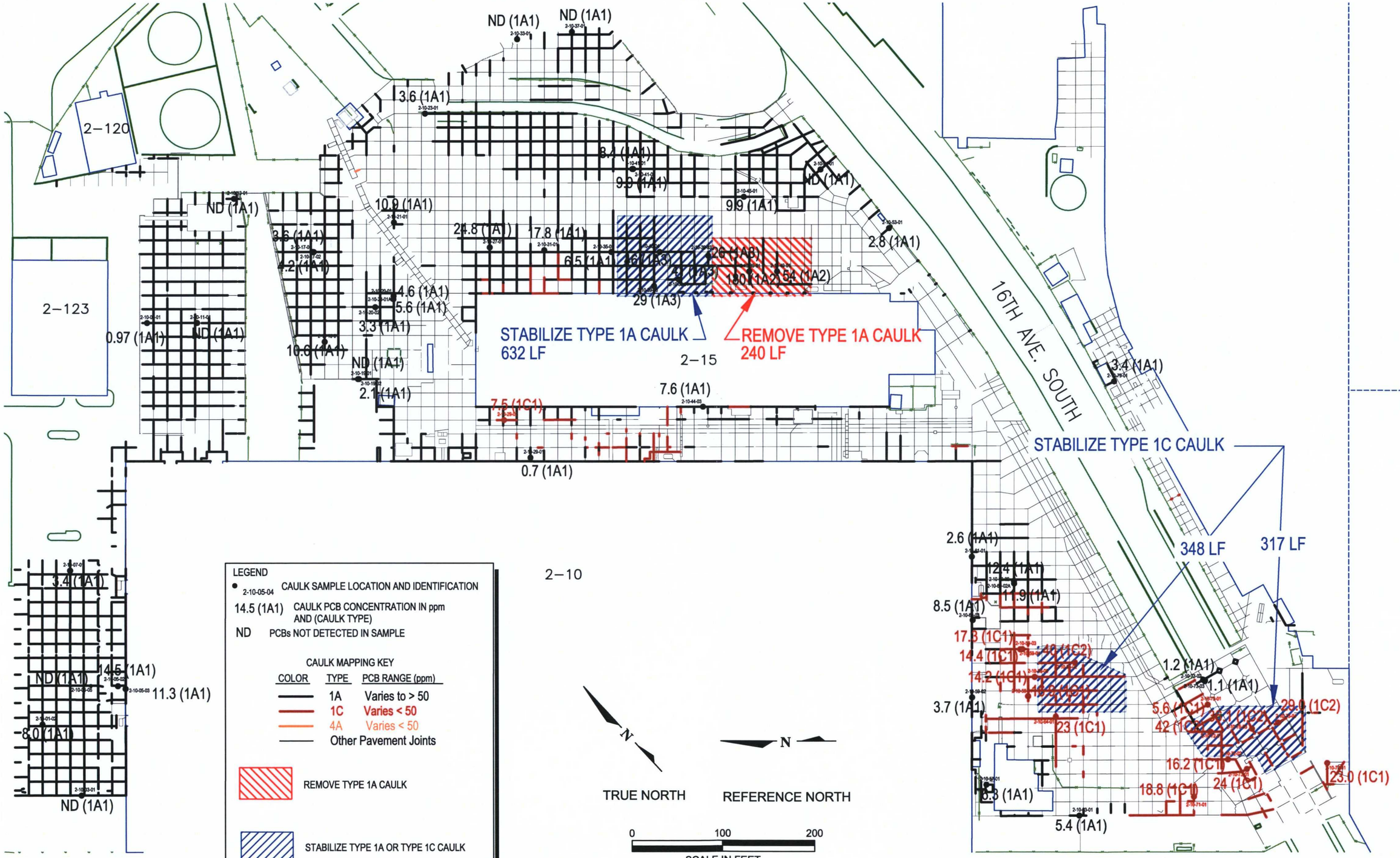


FIGURE **7**

2-10 AREA CAULK REMOVAL OR STABILIZATION: ONLY TYPES 1A & 1C

PHASE 2 CAULK CHARACTERIZATION

Golder Associates

EAST MARGINAL WAY SOUTH

2–45

2.6 (1A1)

2–61

REMOVE TYPE 1A CAULK
440 LF

REMOVE TYPE 1A CAULK
490 LF

2.2 (1C1)

12.5 (1A1)

10.3 (1A1)

5.6 (1A1)

39,000 (1A2)

2–85

2.6 (1C1)

3.9 (1A1)

110.0 (1A2)

68.0 (1A2)

45.8 (1A3)

1.7 (1A1)

2–62 SLAB

29,000 (1A2)

4.1 (1A1)

5.1 (1A1)

STABILIZE TYPE 4A CAULK - 10 LF

STABILIZE TYPE 1A CAULK - 110 LF
STABILIZE TYPE 4A CAULK - 20 LF

2–63 SLAB

STABILIZE TYPE 4A CAULK
128 LF

2–80

2–44

18.6 (1C1)

4.02 (1A1)

2–64

ND (1A1)

12.9 (1A1)

1.8 (1A1-R)

13.9 (4A1-R)

7.40 (1A2-R)

ND (1A1-R)

24.0 (1C1)

48.0 (1A3)

29.0 (4A2)

13.0 (1A1)

27.6 (4A2)

44.0 (1C2)

5.2 (4A1)

66.0 (1A2)

8.6 (4A1)

2–81

18.6 (1A1)

22.5 (4A1)

5.6 (4A1)

2–65 SLAB

REMOVE TYPE 1A CAULK
50 LF

STABILIZE TYPE 1A (55')
1C (45'), & 4A (250') CAULKS
350 LF TOTAL

2–51

14.2 (1A1)

7.3 (1A1)

5.4 (1A1)

4.5 (1A1)

5.3 (1C1)

13.9 (4A1)

27.0 (4A2)

STABILIZE TYPE 4A CAULK
915 LF

2–44

2–66 SLAB

2–49

5.7 (1C1)

2.4 (1C1)

8.1 (1A1)

7.5 (1A1)

44.0 (1C2)

ND (1A1)

4.0 (1A1)

STABILIZE TYPE 1C CAULK
13 LF

13.0 (1A1)

4.1 (1A1)

2.3 (4A1)

1.4 (1A1)

JORGENSEN STEEL

DUWAMISH COMMERCIAL WATERWAY

LEGEND

- 2-10-05-04 CAULK SAMPLE LOCATION AND IDENTIFICATION
- 14.5 (1A1) CAULK PCB CONCENTRATION IN ppm AND (CAULK TYPE)
- 13.9 (4A-R) SUFFIX "R" INDICATES CAULK REMOVED
- ND PCBs NOT DETECTED IN SAMPLE

CAULK MAPPING KEY

COLOR	TYPE	PCB RANGE (ppm)
	1A	Varies to > 50
	1C	Varies < 50
	4A	Varies < 50
	Other Pavement Joints	

REMOVE TYPE 1A CAULK

STABILIZE TYPE 1A, TYPE 1C or TYPE 4A CAULK AS INDICATED

N

TRUE NORTH

N

REFERENCE NORTH

0 100 200

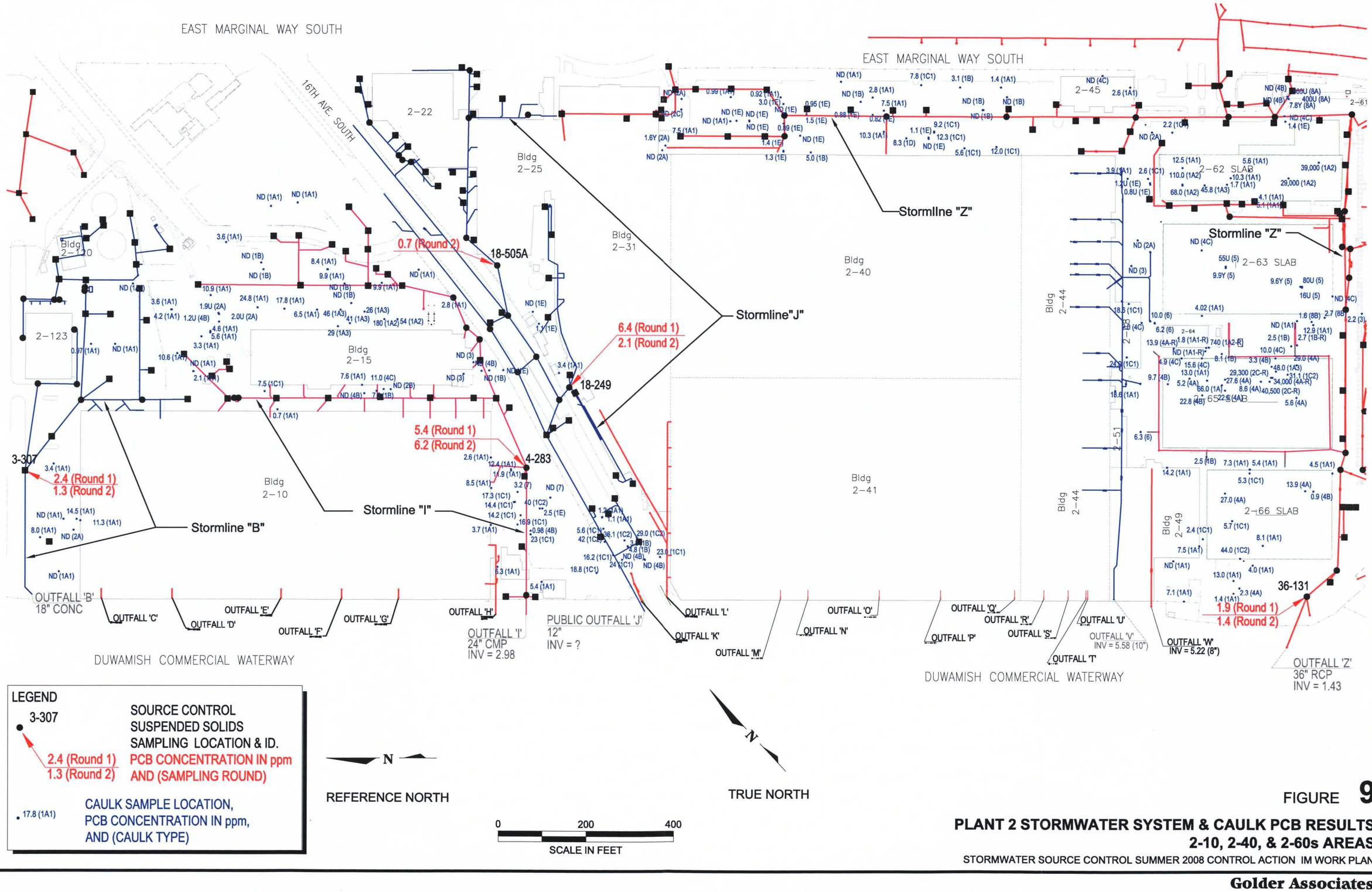
SCALE IN FEET

FIGURE 8

2-60s AREA CAULK REMOVAL OR STABILIZATION: ONLY TYPES 1A, 1C & 4A

PHASE 2 CAULK CHARACTERIZATION

Golder Associates



LEGEND

- 3-307 — SOURCE CONTROL SUSPENDED SOLIDS SAMPLING LOCATION & ID.
- 2.4 (Round 1) / 1.3 (Round 2) — PCB CONCENTRATION IN ppm AND (SAMPLING ROUND)
- 17.8 (1A1) — CAULK SAMPLE LOCATION, PCB CONCENTRATION IN ppm, AND (CAULK TYPE)

N

REFERENCE NORTH

N

TRUE NORTH

0 200 400

SCALE IN FEET

FIGURE **9**

PLANT 2 STORMWATER SYSTEM & CAULK PCB RESULTS
2-10, 2-40, & 2-60s AREAS

STORMWATER SOURCE CONTROL SUMMER 2008 CONTROL ACTION IM WORK PLAN

Golder Associates

ATTACHMENT A

PHOTOGRAPHS OF CAULK TYPES


TYPE 1A
PL2IM-2-10-20-01-C
INCH
1
2
3
4


TYPE 1B
PL2IM-2-40-03-C
INCH
1
2
3
4


TYPE 1C
PL2IM-2-10-75-03-C
INCH


TYPE 1D
PL2IM-2-40-16-01-C
INCH

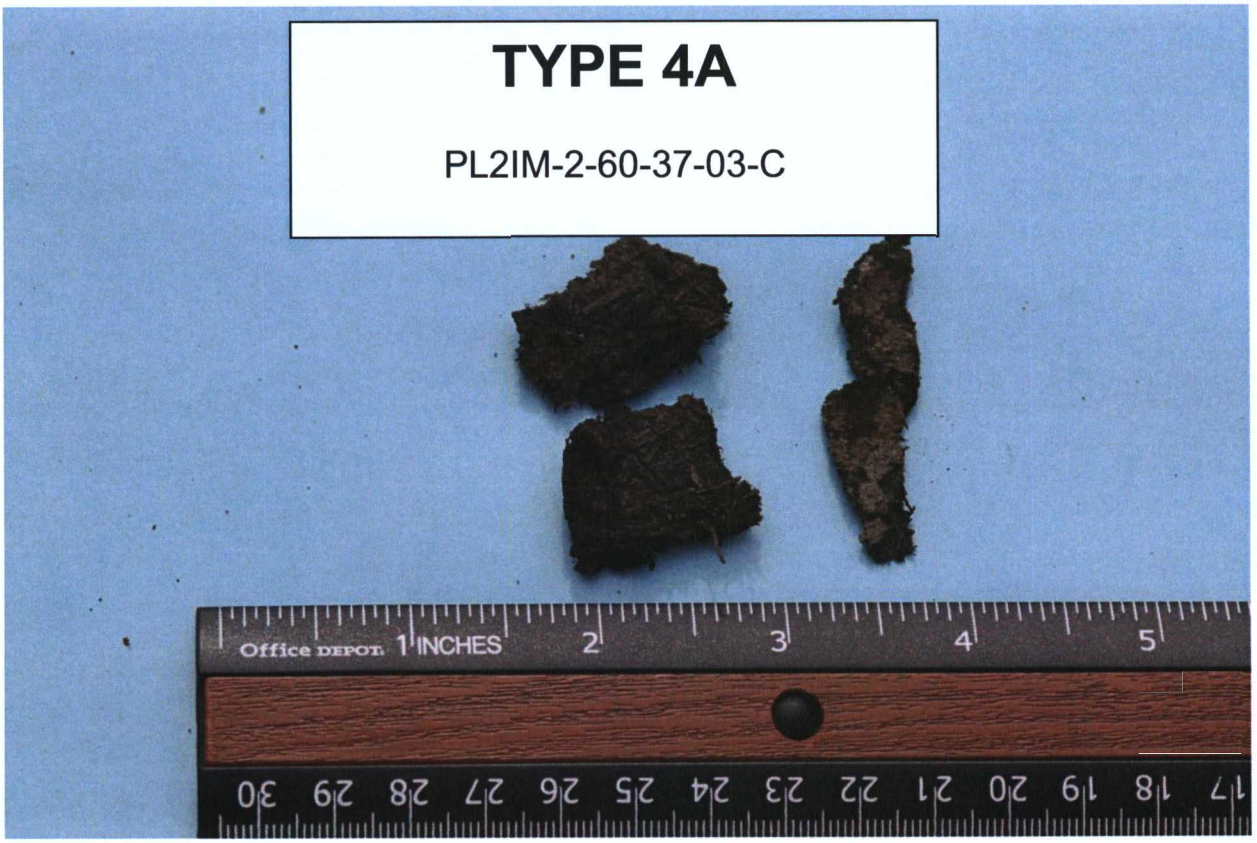

TYPE 1E
PL2IM-2-40-09-03-C
INCH


TYPE 2A
PL2IM-2-10-05-04-C
INCH

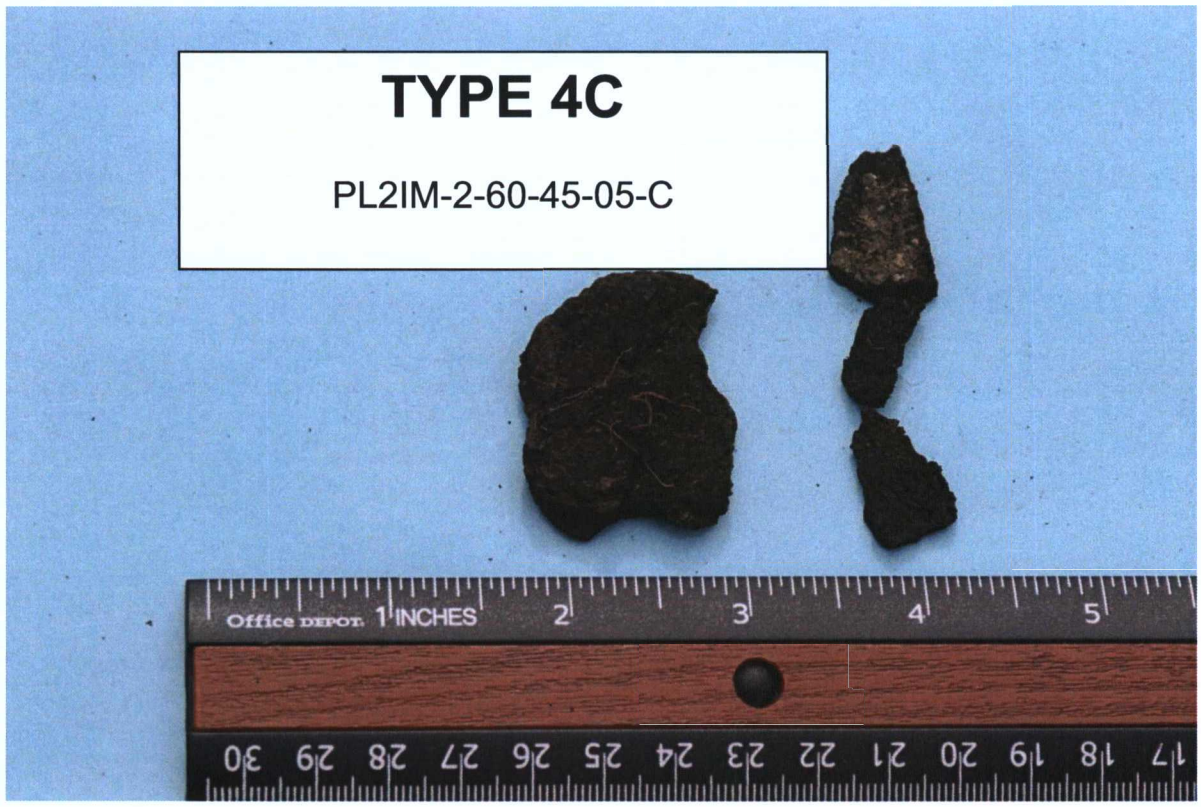

TYPE 2B
PL2IM-2-10-44-01-C
INCH


TYPE 2C
PL2IM-2-40-01-01-C
INCH


TYPE 3
PL2IM-2-10-55-01-C
INCH

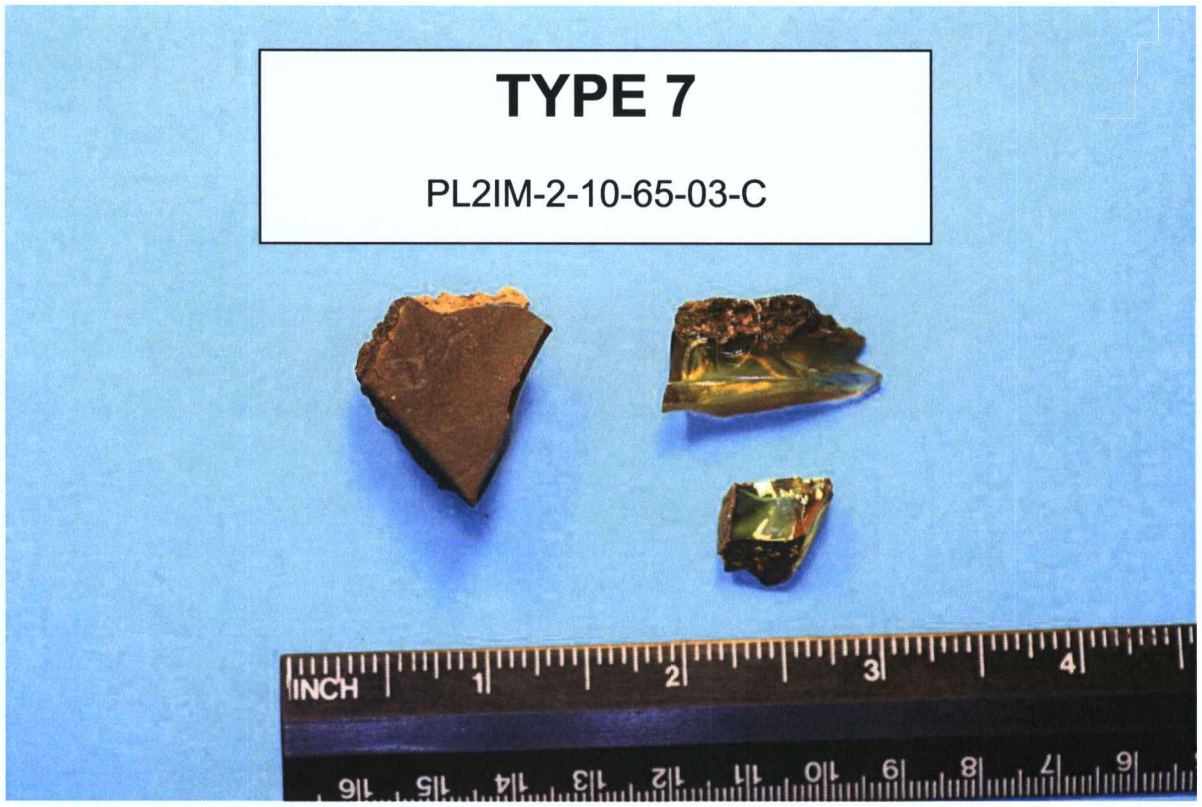

TYPE 4A
PL2IM-2-60-37-03-C
Office DEPOT
INCHES


TYPE 4B
PL2IM-2-10-55-05-C
Office DEPOT. 1 INCHES 2 3 4 5 6


TYPE 4C
PL2IM-2-60-45-05-C
Office DEPOT. 1 INCHES 2 3 4 5


TYPE 5
PL2-JM-X-220-1
INCH


TYPE 6
PL2-JM-X-235-1
INCH


TYPE 7
PL2IM-2-10-65-03-C
INCH


TYPE 8A
PL2-JM-Z-154-4
INCH


TYPE 8B
PL2-JM-Y-214-7
INCH

ATTACHMENT B

DATA VALIDATION QA/QC REVIEW

BOEING PLANT 2
INTERIM MEASURE WORK PLAN
SUMMER OF 2008 CHARACTERIZATION OF CAULK IN CONCRETE PAVEMENTS
DATA VALIDATION QA/QC REVIEW

A total of one hundred and eleven caulk samples (including duplicates) and five equipment blank samples were collected July 8-10, 14, 15, 17, 22, 23, August 19, and September 5 of 2008 as part of an Interim Measure (IM) Work Plan - Characterization of Caulk in Concrete Pavements (Administrative Order 1092-01-22-3008(h)) for the Boeing Plant 2 Facility in Seattle/Tukwila, Washington. The IM Measure Work Plan - Characterization of Caulk in Concrete Pavements (Golder, 2007) sampling effort was performed at the Plant 2 Facility to identify polychlorinated biphenyl (PCB) contaminated caulk. Samples were analyzed by Analytical Resources Incorporated (ARI) of Tukwila, Washington for the following parameter:

- Medium Level Polychlorinated biphenyls (PCBs) by EPA Method 8082

Samples were analyzed in accordance with procedures described in *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (USEPA SW-846, 3rd edition) 8082.*

Samples were analyzed and results reported by the laboratory in batch number as summarized below:

SDG NE44 (Medium Level PCBs):

PL2IM-2-10-01-01-W	PL2IM-2-10-13-01-C	PL2IM-2-10-19-02-C
PL2IM-2-10-01-02-C	PL2IM-2-10-17-01-C	PL2IM-2-10-23-01-C
PL2IM-2-10-03-01-C	PL2IM-2-10-17-02-C	PL2IM-2-10-33-01-C
PL2IM-2-10-07-01-C	PL2IM-2-10-21-01-C	PL2IM-2-10-37-01-C
PL2IM-2-10-11-01-C	PL2IM-2-10-15-01-C	
PL2IM-2-10-09-01-C	PL2IM-2-10-19-01-C	

SDG NE66 (Medium Level PCBs):

PL2IM-2-10-61-01-C	PL2IM-2-10-73-01-C	PL2IM-2-10-51-01-C
PL2IM-2-10-59-01-C	PL2IM-2-10-73-02-C	
PL2IM-2-10-59-02-C	PL2IM-2-10-73-03-C	
PL2IM-2-10-57-01-C	PL2IM-2-10-77-01-C	
PL2IM-2-10-63-01-C	PL2IM-2-10-79-01-C	
PL2IM-2-10-71-01-C	PL2IM-2-10-49-01-C	

SDG NE97 (Medium Level PCBs):

PL2IM-2-10-29-01-C	PL2IM-2-10-35-01-C	PL2IM-2-10-45-01-C
PL2IM-2-10-29-02-C	PL2IM-2-10-41-01-C	PL2IM-2-10-53-01-C
PL2IM-2-10-27-01-C	PL2IM-2-10-41-02-C	PL2IM-2-10-53-02-W
PL2IM-2-10-31-01-C	PL2IM-2-10-39-01-C	

SDG NF44 (Medium Level PCBs):

PL2IM-2-40-15-04-C	PL2IM-2-40-31-01-C	PL2IM-2-60-07-01-C
PL2IM-2-40-17-01-C	PL2IM-2-40-11-01-C	PL2IM-2-60-09-01-C
PL2IM-2-40-21-01-C	PL2IM-2-60-05-01-C	PL2IM-2-60-09-02-C
PL2IM-2-40-23-01-C	PL2IM-2-60-01-01-C	
PL2IM-2-40-25-01-C	PL2IM-2-60-03-01-C	

SDG NF65 (Medium Level PCBs):

PL2IM-2-60-11-01-C	PL2IM-2-60-19-02-C	PL2IM-2-60-23-01-C
PL2IM-2-60-11-02-C	PL2IM-2-60-19-03-C	PL2IM-2-60-35-01-C
PL2IM-2-60-15-01-C	PL2IM-2-60-21-01-C	PL2IM-2-60-47-01-C
PL2IM-2-60-19-01-C	PL2IM-2-60-21-02-W	PL2IM-2-60-53-01-C

SDG NG13 (Medium Level PCBs):

PL2IM-2-60-37-01-C	PL2IM-2-60-49-01-C	PL2IM-2-60-81-01-C
PL2IM-2-60-45-01-C	PL2IM-2-60-73-01-C	PL2IM-2-60-87-01-C
PL2IM-2-60-45-02-C	PL2IM-2-60-73-02-C	

SDG NG82 (Medium Level PCBs):

PL2IM-2-10-20-05-C	PL2IM-2-10-75-06-C	PL2IM-2-60-39-01-C
PL2IM-2-10-44-04-C	PL2IM-2-10-75-07-W	PL2IM-2-60-45-03-C
PL2IM-2-10-44-05-C	PL2IM-2-60-07-02-C	PL2IM-2-60-45-04-C
PL2IM-2-10-55-05-C	PL2IM-2-60-21-03-C	PL2IM-2-60-45-05-C
PL2IM-2-10-65-04-C	PL2IM-2-60-37-02-C	PL2IM-2-60-43-01-C
PL2IM-2-10-75-05-C	PL2IM-2-60-37-03-C	PL2IM-2-60-43-02-C

SDG NH01 (Medium Level PCBs):

PL2IM-2-60-42-01-C	PL2IM-2-60-96-01-C	PL2IM-2-60-47-02-C
PL2IM-2-60-42-02-C	PL2IM-2-60-96-02-C	PL2IM-2-60-47-03-W
PL2IM-2-60-58-01-C	PL2IM-2-60-96-03-C	
PL2IM-2-60-62-01-C	PL2IM-2-40-31-01-C	

SDG NN57 (Medium Level PCBs):

PL2IM-2-10-39-03-C	PL2IM-2-10-59-05-C	PL2IM-2-10-72-03-C
PL2IM-2-10-39-04-C	PL2IM-2-10-64-01-C	PL2IM-2-10-39-02-W
PL2IM-2-10-59-03-C	PL2IM-2-10-72-01-C	
PL2IM-2-10-59-04-C	PL2IM-2-10-72-02-C	

SDG NN58 (Medium Level PCBs):

PL2IM-2-10-39-05-C	PL2IM-2-10-40-04-C

Quality assurance/quality control (QA/QC) reviews of laboratory data were performed in the laboratory in accordance with the laboratory quality assurance program plan. The data validation QA/QC review focused primarily on laboratory result summary sheets and quality control

summary sheets to ensure that work plan data quality objectives were met for the project. Data validation was conducted in accordance with the criteria outlined in the National Functional Guidelines for Organic Data Review (EPA 1999) and modified to include method specific requirements of the laboratory analytical methods. Raw data sheets were reviewed as necessary to confirm conditions reported and to support application of qualifiers to analytical results.

The validation level for the data is Level I with a Level II if data were defective, as specified in Section 4.5 in the IM Measure Work Plan – Characterization of Caulk in Concrete Pavements (Golder, 2007) herein referred to as the IM Work Plan (Golder, 2007). It should be noted that Section 4.5 - Data Review, Validation, and Verification of the IM Work Plan (Golder, 2007) indicates that data will undergo a Level 1 (basic) review. The following is a summary of quality control elements associated with each analytical fraction and the status of that element as a result of the data validation process.

SAMPLING, DOCUMENTATION AND REPORTING

In several cases cooler temperatures exceeded the recommended temperature (4°C $\pm$ 2°C) for sample preservation. No action was taken since in these samples were collected and delivered to the laboratory on the same day.

Caulk reporting limits, in some cases, are slightly less than reporting limits for their respective method blanks. ARI indicates that in some cases initial sample volume was slightly greater than method blank which impacts the reporting level. No action was taken as these reporting discrepancies are minor.

- All SDGs: ARI case narrative, extraction, and various GC analyst notes indicate, in general, caulk sample matrices extraction and analyses for Medium Level PCBs by EPA Method 8082 were problematic. ARI anticipated these issues based on analytical issues which arose from caulk characterization performed in 2007. Selected samples were reextracted and reanalyzed due to matrix issues. Extraction and GC analyst notes indicate that samples needed both extensive cleanups and/or modified extraction methods due to matrix interference.

- SDG NF65: There are two electronic files (PDFs) for this SDG, one with an appended REV in the electronic file name. ARI indicates that two caulk samples were missing from the original report (ARI, 2008) hence the revised report and associated electronic file.

- SDGs NG82: Insufficient volume was collected for matrix spike analyses. Refer to Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) results for more information. Sufficient sample was collected to perform matrix spike analyses on samples associated with SDGs NE44, NE97, NF65, NH01, and NN57.

- SDG NH01: Due to poor surrogate recovery and limited sample volume needed for reextraction field duplicate sample (PL2IM-2-60-96-02-C) was recollected August 19, 2008, about one month, after original sample (PL2IM-2-60-96-01-C) and sample duplicate (PL2IM-2-60-96-02-C) were collected. Refer to Field Duplicate section for more information.

- SDG NH01: Sample PL2IM-2-60-96-01-C was reextracted on August 15, 2008 and reanalyzed on August 16, 2008 due to poor surrogate recovery. The Form 1 and Form II (Surrogate Recovery Summary) sample identification for reextracted sample PL2IM-2-60-96-01-C were corrected by the data validator to read PL2IM-2-60-96-01-C REEXTRACT.

- SDG NH01: Sample PL2IM-2-60-96-02-C was originally collected July 23, 2008 however the Form 1 shows the recollected sample date of August 19, 2008. Form 1 sample collection date for PL2IM-2-60-96-02-C was corrected by the data validator to read July 23, 2008.

- SDG NG82: Chain of custody form shows sample identification for caulk sample PL2IM-2-10-65-03-C. Sample identification was changed by the laboratory to read PL2IM-2-10-65-04-C per Golder's instructions. Sample identification PL2IM-2-10-65-03-C was previously assigned to a sample collected October 27, 2007.

- SDG NG82: Chain of custody form sample identification for caulk sample PL2IM-2-10-75-07-C was corrected by the laboratory to read PL2IM-2-10-75-07-W per Golder's instructions.

- SDG NH01: Chain of custody form sample identification for caulk sample PL2IM-2-60-47-03-C was corrected by the laboratory to read PL2IM-2-60-47-03-W per Golder's instructions.

POLYCHLORINATED BIPHENYLS

The laboratory provided a full data package for the PCB analysis the items reviewed during validation are summarized below.

Analytical Methods – *acceptable*

Samples for PCB analysis were analyzed by gas chromatography/mass spectrometry (GC/MS) using EPA SW846 Method 8082. Extraction methodology was modified in some cases (e.g. reduced initial sample volume extracted, microwave digestion) along with multiple cleanup steps (acid, sulfur, and silica) to improve efficacy of extraction.

Sample Holding Times– *acceptable*

All samples were extracted within 7 days (for water) and 14 days (for caulk) of collection and analyzed within 40 days of sample extraction with the following discussion:

The EPA recommended holding time criteria of 14 days is applicable to soil and is not applicable to caulk samples. The 14 day holding time was used as guidance.

Laboratory Reporting Limits – *acceptable*

The laboratory achieved the reporting limits (RLs) required per the IM Work Plan (Golder, 2007), with the following issues noted:

- SDG NE97: Aroclor 1254 was detected at 740 µg/Kg just below the reporting level of 800 µg/Kg in Sample PL2IM-2-10-29-01-C. The result is qualified as estimated (J) by the laboratory and the data validator to indicate that the concentration is an estimated amount.

- SDGs NF44, NF65, NG13, NG82, NH01, NN57, and NN58: In several cases the laboratory assigned a "Y" qualifier to indicate that "the analyte was not detected at or above the reported concentration". The reporting limit is raised due to chromatographic interference. The Y flag is equivalent to the U flag with a raised reporting limit".

- SDG NN57: Sample PL2IM-2-10-59-03-C Aroclor 1254 results are 'P' qualified by the laboratory to indicate that primary and confirmatory column results exceeded 40 % relative percent difference (RPD) though no chromatographic interference was apparent. Sample PL2IM-2-10-59-03-C Aroclor 1254 result is qualified as estimated (J) due to the elevated RPD value.

- SDG NN58: Analyst notes indicate that for Sample PL2IM-2-10-39-05-C the Aroclor 1254 result is elevated due to Aroclor 1260. Sample PL2IM-2-10-39-05-C Aroclors 1254 and 1260 results are qualified as estimated (J) due to potential target analyte interference.

The reporting limits were not met in cases in which the samples were analyzed at dilutions due to high concentrations of target compounds or matrix interference.

Instrument Calibration

A review of the instrument calibration, and calibration frequency was performed. All of the initial calibration criteria for the target analytes, as listed on Table 4 of the IM Work Plan, were met however due to analytical issues with the caulk sample matrix many continuing calibration (CCAL) criteria were not met and impacted samples are listed as follows:

Sample	Compound	Qualification	Reason
NE44 PL2IM-2-10-01-02-C PL2IM-2-10-07-01-C PL2IM-2-10-09-01-C PL2IM-2-10-17-01-C PL2IM-2-10-17-02-C PL2IM-2-10-21-01-C PL2IM-2-10-15-01-C PL2IM-2-10-19-02-C PL2IM-2-10-23-01-C	Aroclors 1254, 1260	J	CCAL >15% D
NF44 PL2IM-2-40-25-01-C PL2IM-2-40-31-01-C PL2IM-2-40-11-01-C PL2IM-2-60-05-01-C PL2IM-2-60-03-01-C PL2IM-2-60-09-01-C PL2IM-2-60-09-02-C	Aroclors 1016, 1242, 1248, 1254, 1260, 1221, 1232	UJ/J	CCAL >15% D

Sample	Compound	Qualification	Reason
NF65 All Samples except PL2IM-2-60-21-02-W	Aroclor 1260	J	CCAL >15%
NG13 All Samples	Aroclor1260	J	CCAL >15%

- SDGs NE44, NF65, and NG13: Opening and closing continuing calibration data for Aroclor 1260 were generally recovered "high" (calculated amount was greater than the true amount) thus percent differences exceeded 15%. This is likely due to a somewhat cumulative effect of the caulk matrix on the instrument columns. In these instances positive detections for Aroclor 1260 (SDG NE44 Aroclor 1254 detections were qualified for this reason also) were qualified as estimated (J).

Blank Contamination – *acceptable*

The method and equipment blanks (Samples PL2IM-2-10-01-01-W, PL2IM-2-10-53-02-W, PL2IM-2-10-75-07-W, PL2IM-2-60-21-02-W, PL2IM-2-60-47-03-W, and PL2IM-2-10-39-02-W) were free of target compounds.

Surrogate Recovery

All surrogate recoveries were within control limits with the following exceptions and discussion:

- SDGs NE44, NE97, NF65, and NN57: Surrogate recoveries were evaluated against client stipulated control limits (Table 4 - Project Sample Matrix Acceptance Criteria for Surrogates are listed as 40 % - 140 %) and current ARI control limits for medium level PCBs which are 46 % -153 % for decachlorobiphenyl (DCBP) and 46 % - 135 % for tetrachlorometaxylene (TCMX). SDGs. Since ARI control limits for medium level PCBs were not established along with the multiple cleanups, ARI (refer to SDGs NE66, NF44, NG13, NG82, NH01, and NN58) defaulted to slightly broader surrogate control limits for this project (30 % - 160 %). Most sample surrogate recoveries are within the client and ARI control limit criteria. Exceptions to this are noted below.

- SDG NE44: Decachlorobiphenyl (DCBP) surrogate recovery for Sample PL2IM-2-10-17-01-C and PL2IM-2-10-23-01-C was high and above criteria stipulated in the IM Work Plan (also above ARI control limit criteria). Samples PL2IM-2-10-17-01-C and PL2IM-2-10-23-01-C positive detected results are qualified (J) due to high recoveries of DCBP surrogate. Refer to Calibration Section for more details.

- SDG NE97: DCBP surrogate % recovery for sample PL2IM-2-10-31-01-C was slightly higher than the medium level PCB upper control limit at 159%. Sample PL2IM-2-10-31-01-C was diluted 4X due to elevated target analyte concentrations. Default control limits of 30 % -160 % were used to evaluate recovery. No action was taken on this basis.

- SDG NE97: DCBP and TCMX surrogate recoveries for Sample PL2IM-2-10-39-01-C were not recovered due to elevated target analyte concentrations and subsequent dilution. No action was taken.

- SDG NF65: DCBP surrogate % recovery for sample PL2IM-2-60-11-02-C was not reported due elevated target analyte concentrations and subsequent dilution. No action was taken.

- SDG NG13: DCBP surrogate % recovery for sample PL2IM-2-60-81-01-C was not reported due elevated target analyte concentrations and subsequent dilution. No action was taken.

- SDG NH01: Surrogate recoveries for Sample PL2IM-2-60-96-01-C and its field duplicate sample, Sample PL2IM-2-60-96-02-C were low for DCBP and for field duplicate sample both surrogate recoveries were less than 10 %. Sample PL2IM-2-60-96-01-C was reanalyzed and due to insufficient sample the field duplicate sample, Sample PL2IM-2-60-96-02-C, was recollected and resubmitted for analyses. Surrogate percent recovery criteria were met for both reextracted and reanalyzed sample and respective field duplicate sample. Results for original sample results, Sample PL2IM-2-60-96-01-C and PL2IM-2-60-96-02-C are qualified as estimated (UJ/J). Refer to Field Duplicate Section for more details.

- SDG NN58: DCBP surrogate % recovery for sample PL2IM-2-10-40-04-C was not reported due elevated concentrations and subsequent dilution. No action was taken.

Internal Standard Recovery

The internal standard criteria were met with the following discussion:

- SDGs NE44, NF65, and NG13: Analyst notes indicate that recoveries for hexabromobiphenyl (HBBP, Internal Standard # 2, or IS#2) on the primary and/or the confirmatory GC Columns (Columns ZB5 and ZB35) dropped steadily throughout the run. The analyst notes (refer to SDG NE44) suggest that the caulk matrix while impacting IS#2 % recovery negatively may cause an increase in quantifications for analytes associated with IS#2. Data validator calculations confirm that lower IS#2 recoveries tend to positively bias the final results that are quantitated against it. It should be noted that all IS standards were within performance criteria for sample results – in many cases samples were reanalyzed (and sometimes reextracted) to ensure that QC criteria were met. Review of continuing calibration data shows that in most cases that calculated amount was greater than the true amount and the calculated average was greater than 15 % difference. Refer to the Calibration Section for additional information.

Matrix Spike Compound Recovery

Matrix Spike/Matrix Spike Duplicate (MS/MSD) spike recoveries and relative percent difference (RPD) were acceptable per IM Work Plan (Golder, 2007) with the following discussions:

- SDG NE97: MS/MSD was performed on Sample PL2IM-2-10-41-02. MS/MSD result for Aroclor 1016 was diluted 4X (as was the original sample) due to elevated concentrations of target analytes and qualified as estimated (J) by the laboratory. No action was taken.

- SDG NG82: MS/MSD was not performed on the sample PL2IM-2-10-75-06-C as requested because there was insufficient sample provided. No action was performed as

there is a sufficient measure of accuracy and precision data available in associated field duplicates, and other selected MS/MSD samples.

- SDGs NG82, NE66, NF44, NG13, and NN58: Matrix spike analysis was not performed. Refer to LCS/LCSD results for more information.

Laboratory Control Sample Recovery

Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD) spike recoveries and RPD were acceptable per IM Work Plan (Golder, 2007), with the following issues:

- SDG NH01: No LCSD was performed however sufficient precision data were available with the original results. The reextracted and reanalyzed field duplicate pair – Samples PL2IM-2-60-96-01-C and PL2IM-2-60-96-02-C while no target analytes were detected in field duplicate pair the reporting levels are raised five fold for field duplicate Sample PL2IM-2-60-96-02-CREEXTRACT. No action was taken other than to note this.

- SDG NE66: No LCSD was performed however field duplicate data associated with this SDG provided adequate precision data.

Field Duplicate Sample Analysis

Field duplicate samples were collected and analyzed as follows:

Laboratory SDG	Sample	Field Duplicate
NE44	PL2IM-2-10-17-01-C	PL2IM-2-10-17-02-C
NE44	PL2IM-2-10-19-01-C	PL2IM-2-10-19-02-C
NE97	PL2IM-2-10-41-01-C	PL2IM-2-10-41-02-C
NE66	PL2IM-2-10-73-02-C	PL2IM-2-10-73-03-C
NG82	PL2IM-2-10-75-05-C	PL2IM-2-10-75-06-C
NF65	PL2IM-2-60-19-01-C	PL2IM-2-60-19-02-C
NH01	PL2IM-2-60-96-01-C	PL2IM-2-60-96-02-C
NN57	PL2IM-2-10-59-03-C	PL2IM-2-10-59-04-C

Field duplicate pair results for PCBs are comparable with the following discussion:

- SDG NN57: PCB Aroclor 1254 results for sample (PL2IM-2-10-59-03C) and sample duplicate (PL2IM-2-10-59-04C) results were 11,000 µg/Kg and 8,000 µg/Kg respectively (32% relative percent difference). It should be noted that sample PL2IM-2-10-59-03C Aroclor 1254 result is already qualified as estimated (J) due to elevated percent difference between both columns. No action was taken other than to note this as a minor disagreement.

Field duplicate data are considered comparable with the following discussion:

- SDGs NH01: No target analytes were detected in field duplicate pair however reporting levels are raised five fold for field duplicate Sample PL2IM-2-60-96-02-CREEXTRACT. Original surrogate recovery results for field duplicate Sample PL2IM-2-60-96-02-C were low. Since the field duplicate was used up it was recollected in the field on August 19,

2008 and reanalyzed. Original sample and field duplicate sample results are comparable though qualified as estimated due to poor surrogate recoveries.

Data Qualifiers

Data qualifiers applied by the laboratory have been removed from the data summary report sheets and superseded by data validation qualifiers as follows:

The following qualifiers were used to modify the data quality and usefulness of individual analytical results.

U - The constituent was analyzed for, but was not detected above the reported sample quantitation limit.

J - The constituent was positively identified and detected; however, the concentration reported is an estimated value because the result is less than the quantitation limit or quality control criteria were not met.

UJ – The constituent was not detected; the associated quantitation limit is an estimated value because quality control criteria were not met.

R – Data are rejected due to significant exceedence of quality control criteria. The analyte may or may not be present. Additional sampling and analysis may be required to determine the presence or absence of the constituent. For statistical reasons, rejected values are not included in the database.

Y – The reporting limit is elevated due to interference. The result is not detected.

Data Assessment

Data review and validation was performed by an experienced quality assurance chemist independent of the analytical laboratory and not directly involved in the project. This is to certify that I have examined the analytical data and based on the information provided to me by the laboratory, in my professional judgment, the data are acceptable for use except where indicated by data qualifiers, which may modify the usefulness of those individual values.

Jessie Compeau

September 29, 2008
Date

Jessie Compeau
Validator
Informa, LLC

October 15, 2008
Date

Kent M. Angelos
Project Director
Principal Environmental Scientist

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